FOOD: ITS RELATION TO HEALTH AND DISEASE

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BY

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This work is dedicated by his son and grandson to the memory of

BENJAMIN CUTTER

A.M., Harvard—M.D., Harvard and University of Pennsylvania

Born 1804; died 1864.

"Keen in observation, sound in judgment, prompt in action, diligent in study, modest yet self-reliant, with a mind of the highest order, possessing extensive and varied acquirements, he honored his profession in a practice of nearly forty years. As a citizen always reliable, as a Christian always consistent, his death carried sorrow to all who knew him."

PREFACE

This subject was never so widely studied and apparently never were there so many peculiar and clashing foodal ideas as now. It is hoped that this publication will throw some light and increase attention on this most important matter. The personal relation of the authors is naturally close; both have labored seriously on this production; but it can be frankly said that the senior could have accomplished the result without the aid of the junior, while said junior alone could not have produced such a result. That many more years of terrestrial activity may be the lot of the senior is the hope of the undersigned.

JOHN ASHBURTON CUTTER.

New York, February 1, 1907.

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PROLOGUE

Foods are any substances or forms of motion, biologically received from without, that enter into the tissues and fluids of the human body, to become part and parcel of it and normally sustain life.

They may be divided into organic (those that burn), inorganic (those that do not burn), and mental or spiritual. Further, there are four kingdoms of food—animal, vegetable, mineral and mental.

Animal foods include beef, mutton, pork, game, fish, shell fish (clams, oysters), fowls, eggs and milk.

Vegetable kingdom foods include all plants, wheat, rye, barley, rice, tapioca, sago, potato, corn, hominy, buckwheat, dates, prunes, peaches, grapes, sugar, celery, tomatoes, pepper, mustard, tea, coffee, chocolate and their preparations. It is not right conventionally to exclude the grains, as grains are plants.

The mineral foods are air (including nitrogen, oxygen, ozone), common salt and other salts, and all waters, including their salts in solution; the mineral elements in the human body as lime, potash, soda, magnesia, fluorine, sulphur, iron, chlorine are furnished by the three kingdoms just named.

Mental kingdom foods are music, speech, ideas, knowledge, arithmetic, grammar, literature. Some may object to this division, but all are foods, other things being equal, that fill the needs of the body and mind. So-called foods that take away mind and will, that craze and make mad like alcohol, are spirituous, but not spiritual and are not foods in the common acceptation of the term.

Other Divisions of Food

Good or bad: A good food may be bad from the way it is selected, kept, cooked or used. It may be wrongly chosen, kept too long, cooked badly and eaten too much of at a time.

The condition of the eaters: As the spiritual, distinguishing great religious sects and making castes, as among the Hindoos. See also the Old Testament. Also whether eaters are well or ill; have an appetite or not; whether they eat to live or live to eat; whether they are infants, youths or aged, or can select their food or not—as shipwrecked sailors in desert places, that is, location, environment.

Very important groups relate to physiology, the science of health; pathology, or the science of disease; chemistry, or the science of composition; morphology, or the science of the form elements.

Another division relates to the length of time a healthy man can live on single foods and keep well. Another to the effect of double or multiplied foods at meals and to the production of disease by feeding common foods exclusively for a specific length of time. An important division relates to curing disease by feeding rightly. There are divisions as to the parts of the body, as brain or nerve, heart, bone, tooth, hair or nail food. Another as to how often it is used, The chemists much prize the division of food as to heat units which are called calories (calor-heat). Physicists delight in the division of foods in dynamis (not dynamos) or the conferring of force or energy, including electricity, magnetism or will, that in action is called real, and when stored, potential. A division that physicians of all schools prize is that of change of climate.

Food is also called natural and unnatural—the first the instinct of savages, while the second is found most in civilized life.

The division or test most popular in civilization is the choice of food by its beauty to the eye, the taste and ear; that is, the æsthetic. The French affirm that foods that look and taste good must be good. What a beauty to the thirsty ear is the sound of ice in a pitcher of water on a hot day! Or the crackling in the frying-pan to a hungry, tired hunter of the game he has brought home! Many shorten their lives from this love of beauty in the taste of food, over and above everything else.

Fashions in food: Custom has the greatest weight in selecting food, but the first thought should be, will this feeding agree with my health?

AIR

The first food taken after birth is breath or air. It is a food, because its oxygen goes at once into union with the blood (in the lungs), which "is the life," and without air comes death in five minutes or less. In other words, air builds up the liquid tissue blood, replacing blue (venous) blood with red (arterial) blood and thus sustains life. The ancients called air, food. The moderns do not conventially in words, but in deeds; especially in annual migrations to the mountains and sea by millions and in home and foreign travel to recuperate body and intellectual life by fresh air.

Besides oxygen, air contains nitrogen, argon, steam or watery vapor, fog, mist, cloud, rain, snow, hail, smoke. The physical forms found in the air teach that it is a great vehicle or carrier of finely divided substances, organic and inorganic. This is proved by dust on furniture in closed rooms. A 36-inch in diameter glass-topped microscope table in the eighth story of a New York apartment house in summer time would be covered with dust in half a day so that one's name could be writ on it. A common house water pail was filled with snow in a sheltered place under trees in a thicket in Central Park, New York. Melted, there was a half inch of soot-black dirt, which under the microscope was made up mainly of minute balls or spheroids of half burnt soft coal cinders coming from the elevated railroad more than 1,000 feet away.

Clouds of smoke; the missiles in tornadoes; the bacteria that sunlight kills; the organisms borne more than sixty feet high in moist air of malarious climes; the parasites of grippe; insects and winged fowl; all are found in air.

Light exists without air, but there is no light for man without the medium of air. Man could not live in total darkness. So air is mentioned here not only as a body but also as a mental food, in the glories of the treasures of radiance revealed at sunrise and sunset. No matter if unappreciated, these displays are rich spiritual food to many souls.

Among the invisible mental foods in air are speech and song. All that we hear are things of the air. The joys, the glories, the wealth of language, spoken or sung, and vocal griefs and disgraces would be nought save for air.

Electricity influences the quality of air as food. Witness the salubrity after thunderstorms, which is due not to moisture alone but to the ozone, the cool temperature and the washing out of foreign bodies from the atmosphere.

Sea air is not strictly pure, for it holds salt in suspension with water; dust settles in the sea and is lost.

The friction of water waves with air generates ozone. Professor R. E. Rogers, 1853-54, showed a machine of his invention where electricity was generated by the friction of steam and air through holes in apple tree wood.

The effect of canals replacing streets was shown in

Amsterdam (Holland), 1890; the canals not only collected street dust, but lessened the number of wheels to grind pavements to powder.

The tips and points of leaves of trees are silent dissipators of air electricity and thus may help the conversion of carbon dioxide into oxygen and carbon and as a form of motion may stimulate and facilitate the life motion of the leaf cells to the full performance of their functions, especially as these functions involve the movement of osmosis between liquids and gases.

The term "life of the air" may be due to the sun's light, heat and electricity and to all forms of motion making ventilation; or, to winds and osmosis of air gases and other molecular movements of diffusion and penetration.

Some of the requisites of healthy air food are general motions to carry off the heavy carbonic and carbonous acid gases and the other exhalations from man and fungi, to be replaced by fresh air from elsewhere. It must not be too cold, moist or drafty, since such air carries off heat from the body as buckets do grain in an elevator. Air must not be stagnant as the said acids settle down, making it poisonous. There is also a lack of diffusion of gases where heavy gases underlie lighter ones.

Mushrooms grow best in dampness, darkness and stagnation of air; sunlight air kills them and most fungi; algæ like light.

Impure air food does not fully nourish, hence the body becomes weaker and more liable to disease; sometimes it is the great forerunner of tuberculosis; when the vitality is lowered then the fungi of tuberculosis prey on the system.

If carbonic acid gas were retained in the air in excess mankind would painlessly perish and probably also all leaf and frond bearing plants.

It is not to be inferred that all air fungi destroy life or promote disease if the breather of the air is well. The healthy mucous membranes in breathing through the nose (the natural way) protect; they even make pure the air; light a common sulphur match and hold it burning six inches from your open mouth while you unnaturally breathe through it as long as you can; then make the like test breathing through the nose and you will find the difference. Even the tuberculous bacilli found in a healthy mouth are powerless because of a sound constitution; a man is always more or less surrounded by the causes of disease which are powerless if met by a healthy individuality.

Animalization of fungi means that the fungi, for example, of rye straw are powerless on man unless infected by the fungi of human excretions—then the fungi of the straw becomes poisonous to a high degree. This was pointed out in the Civil War. In the late war with Spain it also transpired that recruits became speedily sick with measles from the rye straw fungi wet with human excretions. It is probably the same with the fungi that cause baldness; they become poisonous when confined under a cap or hat, because of the animalization by the sweat from the head and then they gain entrance to the hair follicles; a lunatic who never wore a hat outdoors or in and preached in rain or shine in a courtyard at Blockley, had a splendid head of kinky hair, probably because the air and sunlight did not allow the fungi to become animalized.

It should be remembered that the mixing of animal liquid and solid secretions with vegetable secretions in sink drains and sewers animalize the innocent fungi into poisonous ones and cause diseases by aerial dispersion.

Bric-a-brac obstruct ventilation. Once a very sick lady was in a small room in a large New York apartment house, gasping for air; the place was full of bric-a-brac and furniture; immediate improvement followed when only the bed and one chair remained in the apartment. A good way to ventilate for fresh air food is to open all the doors and windows, no matter what the hour and weather, and swing the doors to and fro about ten to twenty times a minute; this flushes out the bad air at once; immediately close up before the walls are cooled off; if in winter throw a light shawl over the head of the patient, and no matter how sick, they will be protected. Cases of pneumonia are said to do better out of doors. Reasonable.

Examples of good air food are found on the eastern shore of Buzzard's Bay, Mass.; leave Boston on the hottest day, swelter in the cars until you come to the northern end of the bay and, as a rule, a cool breeze of ozone air food will then refresh you; you can feel its vigor feeding even your spinal cord and strengthening your nerves; these words are used advisedly, as babes improve, thus proving there is no "suggestion or hypnosis." Some think because the fauna or flora of the gulf stream are found in Buzzard's Bay, and because its water is about 25° F. warmer than that of Massachusetts Bay, shortly distant, that it is the gulf stream that gives the bay salubrity; besides, the tides are not synchronous with those of Vineyard Sound nor of the ocean on the east coast of Cape Cod; at Woods Holl the highest tide is only eleven inches, and this may make some difference as to warmth; one may be exposed to the direct rays of the sun on the eastern shore of Buzzard's Bay and not feel the need of shade.

The chief complaint in hot weather about air is its humidity: The higher the degree of humidity the harder the weather is to be borne; the air feels heavier, soggy and weakening, and the accumulation of sweat increases; steam is constantly exhaling from the body surfaces that are exposed to the air, that is, the skin and air passages; breathe on a glass mirror that is cooler than the breath and water will condense on it from the breath as on an ice pitcher on a hot day; if the atmosphere is not saturated, this invisible watery vapor (steam) is readily dissipated, but if the air is saturated with humidity the watery exhalations from the twenty-five miles of human sweat ducts collect on the body surfaces in a very manifest abundance and disagreeableness. Sweat prevents vaporization and hence the total coolness by the vaporization of the sweat is lessened, the body becomes hotter and more uncomfortable to the indwelling spirit and suffers. On the other hand, cold (heat relatively diminished) with high humidity is harder to be borne than dry cold air, because the aerial moisture is a better conductor of heat and electricity than dry air and thus conveys away so fast as to chill the body quickly. Wet clothing chills faster, as its intra and interstitial air is replaced by water and the humid air environment coming from said wet clothing in evaporation by the heat of said body cools by the thermic withdrawal in order to make up the latent heat of said vapor or steam required to liquidize.

Air humidity bears upon food because more is needed to maintain the human body normally—because disease and sickness often follow, sometimes called "colds," which require much food to make health again and because the quality of air food is lessened for some people ailing with gravelly rheumatism, asthma, etc. Besides, the nerve-feeding power of air food is lessened.

Air holds water in steam at all temperatures, even below the zero of Fahrenheit, and in such quantities that it descends in torrents and cloudbursts as distilled water to destroy lives and property.

Air food circulates down deep in the earth and thus feeds the roots of plants carrying the carbonic acid gas and other gases that chance to be in it. The good of hoeing, plowing and cultivating is in facilitating the access of air and water to the soil and plants; soil that has become dry from lack of rain is found to be full of small channels through which the water is being evaporated or drawn up by the sun; a light cultivator will break up these channels, the water will be held in the soil and then pass into the plants; the effect is shown within twelve hours by the increased vigor of the plant life, though no rain has occurred.

MILK *

Milk, containing solids and liquids enough to sustain life, is the next natural food which babes should have. According to prologue, it ranks as organic, animal, mineral, because it comes from animals and contains 92 per cent. of water and all the mineral elements found in the body. It is also intellectual, as it builds up mind and soul in infancy—stands all the physiological tests for babes—is beautiful to the eye and taste—good, if from healthy animals and bad if from unhealthy animals or if contaminated by wrong outside matters or if improperly kept. When good, it makes normal tissues and secretions in the human body. It is also used to combat chronic disease. It furnishes heat and actual and potential† energy.

Good fresh milk is good in any clime. It is Nature's sole food for adults only in large amounts daily. There is again not a sufficiency of milk for adults to live on it alone, and with such subsistence would come wasting of teeth from lack of use.

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* Dairy products, 1899 (U. S.) $600,000,000; milch cows value over $500,000,000; nineteen millions of cows U. S. (Facts about milk, Farmers' Bulletin 42, Dept. Agriculture.)

†In the Boston Subway are signs—"Danger, Third Rail Alive." This rail, looking like the others, has the power to kill those who touch it. Thus its force is potential when intact.

The late Prof. E. A. Wood, M.D., of Pittsburg, fed young dogs on soft foods, and their teeth became bad, while other dogs fed on meat and bones had good teeth. Some of the badness was probably due to want of mineral salts in the soft foods, but not all. Parenthetically, an instance is given of the emperor moth that has the greatest difficulty to come out from its cocoon, but when it is out, its wings expand at once and bear it away; the narrator said that the narrow opening of a cocoon was enlarged with scissors, the moth emerged, but could not fly, as its wings and legs had not been developed by the effort of pushing through the cocoon walls. It is good to have food chewed by the teeth.

Milk is universally acknowledged to be food. Vegetarians claim entire abstinence from animal food, yet strangely put milk at the head of their food lists; to be consistent they should exclude it as the most animal of animal foods. There is an advantage in drinking milk immediately after withdrawal; it has no germs, gases, nor taints absorbed from the air to enter with it into the stomach and there produce unhealthy fermentation and disturb the liver. A majority of grown-up people cannot take milk that has been some hours away from its source, without in time liver and stomach disturbance. Fresh milk has also vital warmth; cattle men know this and feed it in abundance to sickly calves. When immediately bottled, fresh milk can be kept fairly well for a time without any contamination. It, of course, lacks the vital warmth.

There is no need of the conventional lack of warm milk for babes except because of the dictates of fashion which inflict a grievous wrong on the race, weakening the constitution, shortening lives, causing much sickness and death, making tooth cutting a disease, instead of a natural act, producing human bodies with less than the normal resistance to causes of disease, weaker intellects, bad tempers, nervousness, poor eyes, teeth, hair, nails, skins—in other words, conferring bad constitutions that do not stand the wear and tear of life, the worst legacy parents can leave to children. Proper feeding and hygiene for mothers will furnish an abundance of milk. So-called infant foods are not superior to the natural product of lactation; even their makers admit this, but one such said that "No matter what is done, modern mothers will not suckle their babes." Hence it is inferred that mothers will buy foods for their babes of apothecaries.

Milk is made up of water, cream, casein, sugar of milk and all mineral salts found in the system. Because of the refraction of minute oil and fatty acids in globes or globules the color is white, as the color of clouds from infinitesimally divided globules of water, that generally escape the naked eye or as snow looks white from beautiful, feathery six-sided crystals of ice and yet not so small as fat globules in milk. The highest power of the microscope, Tolles American one seventy-fifth inch objective, with a two-inch eye-piece (3750 diameters), shows each globule dancing and rolling about actively with no visible motor power. Some attribute this motion to the disagreement, or want of chemical agreement, with the water of the milk which is colored white by these very globules just as the serum of the blood is reddened by the red corpuscles; [filter the water perfectly from the milk and it will be clear like any other water when the coloring matter is not in solution and does not go through the filter.] If electricity is reasonably a cause of motion of the heavenly bodies, then may it not move these apparently automobile milk globules, whose movements remind one of the small pith balls connected with a static electrical machine in motion? Certainly wireless telegraphy, cars and motors excited by invisible currents of electricity furnish some ground of analogy.

The healthy digestion of milk: The nerve centers of the "abdominal brain," *i.e.,* the solar plexus of nerves, cause an exosmosis (outward flow) of all the water of milk, leaving the casein firmly coagulated by the stomach acid into a cheese, which later an endosmosis (inward flow) of gastric juices commanded by said "solar plexus" will dissolve by the slower process of digestion. Thus there is an easier entrance of this food into the circulation than with solid foods, saving the vital powers (dynamis) in babes to go on with the wonderful work of tissue and organ building. To show the power of the solar plexus it has been said, "Smite a healthy man over the pit of the stomach after a full meal; if not immediately killed, he will fall insensible and the stomach juices will pour out from his mouth in a stream of jelly like discharge."

Curds in the stomach are not necessarily a sign of disease, but when a stomach is foul with alcoholic and vinegar yeast fermentation and upward peristaltic movements bring the curds to light, such are signs of stomach trouble, not because curds come up (for curds are normal in digestion), but because the alcoholic and vinegar ferments cause the trouble, or, to put it differently, when food does not digest nor properly digest, the said yeasts always present attack said undigested foods. But said yeasts should do their work on starches and sugars and not on the milk. . There is a lactic acid alcohol and vinegar at work in sour milk, and when the sugar acid or common alcohol and vinegar are added to the lactic acid family, there may well be a trouble which we call disease, to wit, curds full of such a yeast combination or trust. The solar plexus does well to get rid of them the shortest way, by the gullet, one foot instead of twenty-six feet of intestine. It is well to remember the autonomy of the stomach. (*See* Fermentation.)

Cheese is a good food. Vegetarians adopt it as a vegetable (?) food. It *must* be good to be in two kingdoms, animal and vegetable (?). In the 1648 English civil war cheese was an article of military food on both sides of the conflict (Clarendon's History). And David killed Goliath because they met when David brought cheeses to his brothers who served in Saul's army; (I Samuel 17, 18). Cheese is a concentrated and more permanent food than all other air exposed preparations of milk.

Butter is a partial separation of the solid fats of milk, among which lecithin is found, a brain and nerve food. It is the most royal of all fat foods, used successfully in place of cod liver oil in tuberculosis; it does not clog the liver nor resist digestion like other fats, as margarine and suet; it can be given more safely in the treatment of fatty degeneration, *i.e.,* Bright's disease of kidneys, etc., than any other fat; it affords more potential energy. All the oils of milk are not separated from butter, as oils are found in its morphology, *i.e.,* under the microscope.

Oleomargarine substitutes are not as good as genuine butter, which contains many important fat acids that the "oleo" has not. The fatty areolar tissues of bovines (tallow) and tape worm eggs are not nutritiously equal to the exquisitely and wonderfully compounded phyto-chemical physiological secretion of the epithelial cells of the milk glands.

The ethics of kine milk production are so bad that the State appoints inspectors. In face of the full knowledge that bad milk is disease and death to innocent babes, some farmers, middlemen and retailers have recklessly given proof that the cause of the baby-loss is the greed for gain.

In Boston once, to prevent an Association of Milk Consumers from getting pure milk, middlemen bought up all the milk cans in the city, hired out as deliverers, fouled the milk and also paid servant girls to put the cans with a little milk on red hot stoves, etc. The Secretary of the Massachusetts State Board of Health said that the farmers themselves had been detected adulterating their kine milk.

Skim milk is sold as pure; producers have been known to stall feed kine covered with sores and full of disease. The cow is deprived of her calf which is bad for mother and calf. Stall feeding is not healthy nor natural—affords nests for the development of disease that depends on a retarded and impeded circulation, specially fatty degeneration of muscles and tuberculosis. The hoofs grow all out of shape, making walking difficult. Bad feeding makes bad milk.

Stall cattle fed on sour distillery refuse give the best chance for tuberculosis to develop, which is more prevalent since "silos" feed cattle. Alcohol and vinegar yeasts are abundant in "silo" food. We do not think that tuberculous milk (which we do not recommend) infects healthy people because the disease is successfully resisted. But when one is sick or weak, the danger of communication is certainly great. (It must be remembered that cattle men, working amongst tuberculous cattle, rarely have the disease; this is noted, because there has been so much of late as to the contagiousness of cattle tuberculosis to man.) Some years ago, the senior writer studied the blood of milch kine fed in the open air on fine pasturage and not on silos; the vinegar yeast plant was scarcely found as it is abundantly in man in tuberculosis; while other cattle differently fed and condemned to die by expert veterinarians under the authority of state law, were found to have in the blood the vinegar yeast plants; autopsies confirmed tuberculosis findings before death.* Happily our State Boards of Health

* (American Blood Test for Cattle Tuberculosis, *N. E. Med. Monthly*, July, 1896; *Amer. Monthly Mic. Journal*, Oct., 1896.)

have come to the reform of milk ethics, and now it is possible to get good milk in cities, specially in sealed bottles. Again, public attention has been roused to cattle tuberculosis and there is an improvement in feeding.

Cooking probably prevents the infection from tuberculous milk just as the yeasts in common bread are destroyed by 285° F.

Buttermilk is what is left after butter has been churned out. It is mainly the water, the cheese or casein and the salts, organic and mineral, of the milk.

The quality of kine milk is not as good when in quantity as when scantier. (See reports Conn. Agric. Station.) Jersey kine milk is scant and rich. Holstein cattle are said to produce a large quantity of good milk. Perhaps the best milk comes from crosses of "native" stock with high bred cattle. Forcing processes of kine milk production do not necessarily injure the milk, but there is more water and less of solids. Small Baldwin apples are better than overgrown.

Sterilization of milk is heating it to about 170° F. to prevent fermentation. It is not boiled, as the latter process changes milk chemically to a disadvantage.

Hydrogen dioxide, one teaspoonful to a pint, will keep milk from souring; it is not harmful; does not change the character of the milk.

The best way to sterilize and keep human milk is to hold it in the breasts ready for use with all its dynamic vitality unimpaired in its fresh condition.

In cases of last resort the best substitution for mother's milk is a healthy wet nurse; next the strippings of kine milk diluted one part to two parts water. Sweeten with common sugar. Or, take the upper two-thirds of a jar of milk—add one-third part of water and sweeten with common sugar;

use a tubeless bottle with *an india rubber nipple, that has been kept clean, pure and dry and large enough to invert when washing.*

When milk disagrees with "grown-ups," it is shown by biliousness, indicated by general symptoms often and always by heating the urine with nitric acid, turning the specimen to various shades of brown, red and black, according to amount of bile present; the bile has been absorbed by the blood and removed by the kidneys; instead it should go down because of the worm-like squirmings and motions of the bowels (peristalsis) and participate in the work of digestion therein. One practical proof of the value of milk warm from the cow is that in "grown-ups" it agrees and does not make the urine bilious.

The use of cream and milk in tea and coffee drinks is not necessarily injurious. The troubles that come from tea or coffee drinking are mainly due to the combination of milk and sugar because of their liver-clogging qualities. To anticipate, the liver makes all the sugar or glucose needed, without the adding of sugar to tea or coffee drinks; if the milkless and sugarless Oriental customs of drinking tea or coffee were followed by the Occidentals, there would be less complaint of tea and coffee. For years, experience has shown that sick persons (with a few exceptions) can take sugarless and milkless tea and coffee when on the strictest diet. Many also bear well milk added to tea or coffee.

A good practical way to test whether milk agrees is to study the urine and blood; if milk does not bring free oil from under the skin into the serum of the blood specimen on the slide, nor fatty epithelia nor casts nor albumin into the urine—nor bile—one can be sure that milk agrees with patients.

Milk and cholera infantum: Notoriously this complaint occurs among human-milkless babes or of those whose mothers feed improperly. Nothing is plainer. A primipara had terrible convulsions, the babe being 24 hours old; this experience gave wisdom; care was taken with her food so that all three of her children were fed on their mother's milk; they were sick with cholera infantum but once, caused by miserable feeding in a seashore boarding house.

Cholera infantum here means a disease in the nursing age characterized by profuse or scanty discharges of the bowels. A better term would be chronic diarrhœa. It is common in ill fed babes, specially when cutting teeth; which is a peculiarly hard work for the systemic forces (dynamis). If said dynamis is wasted in digesting poor food and if it is not maintained by a full and complete nourishment, or if, as is sometimes the case, the alimentary canal is partially paralyzed by the gases of fermentation, carbon dioxide, sulphuretted hydrogen, phosphuretted hydrogen, etc., given off by the yeast plants in the intestines—then there is such a loss of dynamis that there is not enough (as said before) to develop the teeth cutting machinery and the teeth suffer simply because the constitution is unequal to the task of dental development and the piercing the gums because the mineral food is scant. And all this sorry state of things because mothers will not eat so as to feed their infants properly, because of fashionable ethics. The young of other animals than man have really a better chance for their birthrights than infants. Can we realize this terrible statement? The mothers who thus deprive their children, also suffer the annoyances, inconveniences and maternal anguish, incident to seeing their children sicken and die. In 1900 we hear of Chinese soldiery slaying infants by tossing them alive on bayonets and spears! This is execrable enough, but is it not a shorter and hence more merciful death than the prolonged agonies, pains and distresses of infants dying by the slow tortures of cholera infantum?

WATER

Fluid wonderful, enters all tissues; a large essential part of the life of all animals and plants; a part of the air, 92 per cent. of the milk, three-quarters at least of the body (human) and very largely goes into all foods (liquids, of course,) and solids. It holds about the earth the sun's heat. It carries heat to frozen zones by the Gulf Stream so that said cold places become warm and inhabitable.

Chemically pure water, H_2O, is made up of one equivalent of oxygen and two of hydrogen; such is said to be found in the laboratories, but that must be taken in a qualified sense as "pure air" is. The distilled water of the chemist made in a closed vessel is unfit to drink; it tastes bad from the burnt odors (empyreumatic), which chemical analysis does not detect, but the drinker does detect with a disgusted palate.

Formless pure water is that from which all forms of plants and animals and of solid mineral matters are removed.

Kinds of water fit to drink (*potable*) are: Aerated distilled water (that is distilled and mixed with air by dropping some 2½ inches from still), spring, well, river, pond, ditch, pool, marsh, driven well, filtered, artesian, hydrant, ship.

Some water combinations not fit to drink are: intoxicating liquors; carbonated drinks; alcohol; drug fluid extracts; essences; cordials, etc., save as medicine given as any other poison.

It should not be forgotten that water is present in grains as wheat and rye, in woods, stones, metals, garments and that there is hardly a physical thing perceivable but what contains more or less water; space in vacuum is waterless.

Distilled Water

At the temperature of average human life, water is a liquid. At higher temperature water becomes steam. The process of changing, by heat, a liquid or solid, is called distillation; also the process of condensing water from steam is included. Thus the psalms speak of distilling the gentle dew of Mt. Hermon; the dew comes as the drops on a pitcher of ice water on a hot day and on plants on cool vapory nights. The two essential steps of distillation are vaporization and condensation.

Object in distilling water: Purification. The steam carries with it none of the salts always to be found in natural waters; nor any bodies less volatile (vaporized); it leaves the plants and animals behind; it loses its air; this is remedied by having the distillate take the spheroidal condition by falling from the still through the air not less than two inches; in this process the air mingles with the water and gives zest and for aught we know supplies needed nitrogen and oxygen to the digestive organs.

Needs of artificial distillation are heat, a closed reservoir for the water, save an outlet for the steam, condensers either of water or air and a receptacle with two inches of outside air for aeration (air mixing); the process is simple; the fewer the complications the better, as they add to the expense and care; the usual form of a water still (not of the laboratory) is a boiler with steam pipe at top issuing into a coil of pipe which is plunged into cold water or air.

The process: First the steam is made. Next it comes into the condenser cooled by water or air. Third it turns into water giving off 700° F. for every unit of comparison; the heat is absorbed by the cold water in one case or air in the other. Fourth, the distillate, in drops, falls and thus takes up the air. There are stills that condense by cold air; a typical one would be to have a steam exhaust go into a metal pipe out of doors, vertical, with protected openings at top of pipe; here the air heated by the steam rises and is immediately replaced by cool air to be treated in like manner and so on exactly as in a common steam radiator; this has been utilized by the writers by putting an inch ledge in a common wash boiler (all around) four inches from the bottom — by arranging an outlet pipe at the lowest point above this rim or ledge; two inches of water are put in the boiler on stove and the still is ready for work even with sea water. *Rain* is distilled water coming from every surface of water, or wet with water, all trees, all bodies of plants and animals as shown by the parched condition of almost everything after a protracted drought; distillation is here called drying; when we dry we distill off the water which goes into the air as invisible vapor (steam) to be wafted to and fro and descend as rain (distilled water).

Once repeating Halle's experiment, a good-sized branch was taken from an apple tree in perfect health on a bright, clear, sunny summer's day; an india rubber tube was tightly sprung over the large end of the branch and the other end of the tube was tightly put into a glass tube two inches long, filled with water, and holding the india rubber tube tight, the glass was set into a vial of mercury; the mercury ran up two inches and stood there drawn up by the evaporation of watery sap from the leaves as it had no chance to return; the mercury was held by the air pressure.

The greatest natural distillers, with the aid of the sun, are the oceans, seas, lakes, aquatic and marine, which constitute five-sevenths of the globe's surface; they run all the time and furnish the invisible steam, clouds, fogs, mist, hail, snow and rain on a stupendous scale, giving boundless supply to water the land. The ocean is salt, as the waters that run in carry more or less of common and other salts, minerals and metals in solution.

Aerated distilled water is best for diseases that are caused by crystals and granules as found in asthma, rheumatism, gout, angina pectoris, gall stones; as, having no salts whatever, its full power can be used to dissolve the gravels, stones, concretions, which never would have been had the sick drank water enough in all probability. Dr. Koppe says distilled water is a poison, but we have never seen poisonous results after years of experience. It is difficult to conceive of its being poisonous, as water is so indispensable to life. The epithelia of the natural cavities or reservoirs form watery liquids for body uses and bear water well. The skin epithelia swell up and turn white when soaked in water (in the washerwoman's hands, for example, but in this case soap is an element). A street vender of a spring water showed hands which were whitened by contact of his goods, but in a long study of the secretions of the human body by the microscope never have we seen any such whiteness of the epithelia. On the contrary, the senior writer's studies of hydrant, pond and lake waters for over thirty years have amazed him by the finding of such a large number of apparently perfect pavement epithelia and it would seem as if human epithelia were, like their congener hair, the most imperishable of tissues in water. So when distilled water is called a poison, destructive of epithelia because it turns skin epithelia white when improperly used, it seems a misnomer. Living epithelia cannot do their work of osmosis, secretion and excretion through their membranous walls unless water is present and the purer the water the better. Aerated distilled water is the purest of waters.

Well Water

This refers to water obtained by holes in the ground, sometimes to the depth of 100 feet; generally a common well is about 15 to 20 feet deep; this method furnishes water for the great mass of civilized mankind in the country mostly from rain water that has soaked into the earth or from melted ice or snow. Well water is not equal to distilled, as it holds in solution the soluble mineral and animal matters that it dissolves on its way to the submerged pond, lake or sea; these dissolved substances are useful to man, but not in large proportion, as phosphorus and the phosphates found in well water form concretions called calculi, a good name, as calculi are to all appearances "stones;" so of marble or carbonate of lime, which has its use, no doubt, but in excess causes marble rheumatism, when it collects in the tissues in granular and crystalline forms. Kidney calculi for more than half a century have been accounted for by surgeons by the use of well water in limestone districts. Such patients were swallowing lime in too large amounts and their drinks already loaded with the lime could not carry off the same as limeless water would have done. An easy way to study the amount of salines in the water of a district is to examine the amount of steam boiler incrustation. Other matters in well water are yeasts and fungi, which give off carbonic acid like animals and cause disease, specially typhoid fever, when animal secretions and excretions mingle in the well, producing albumenoid ammonia which will be dissolved and run through all filters, going even where the yeasts and other fungi do not go or in very minutest proportions. So that well water may stand the tests of taste and eyesight and yet be noxious to those whose constitutions are weak and harmless to those whose constitutions are strong. Other sources of impurity to well water are animals, as to acts and by falling into closed wells where they drown and slowly putrefy. Air gets into closed wells through the ground.

The typical well is the driven tube. If down far enough for filtration and purity even in swamps, ditches, morasses, filthy ponds, lagoons, potable water can be had unless stone impedes the driving. In the Civil war, good water was thus procured in the South where it was thought impossible; as the camp was moved, the well was pulled up and driven in the new bivouac.

Boiling of well water is good, but if too long boiled its air is drawn off and the salts in excess are not removed. But boiling kills most fungi and yeasts (which survive freezing) and prevents cholera.

The excellent publications of the Boards of Health give rules to get good well water, but we may name some: A well should not get the drainings from out-houses, stables, sink drains nor of grounds where slops are emptied. If the soil is not deep, defilement may come from long distances on the surface of the bed rock. Wells should not be dug nor used in crowded city limits, where the earth has become foul with fungous vegetations along with decomposing animal and vegetable matters and in great abundance; there is a natural process of earth purification going on all the time, but in towns and cities, this purification is overwhelmed by the vastness of the work put on it. One has only to go through a city avenue, when the old rusty leaky gas pipes have been dug up and examine the oozing filth of the excavated material, smell its vile odor—to be satisfied that city well water is filthy, indeed, no matter how good it tastes. It would seem as if country wells ought to be all right; but the records of the Boards of Health are full of relations of wells defiled by the drinkers' domestic excretions. It is advisable in *bad* country localities that tube wells be driven 50 to 70 feet so as to have a drainage of the deepest water and a filter often changed that removes all the bacteria, yeasts and fungous growths. Further, a domestic still costing five dollars can be used that will purify the foulest spring water.

Pool, Ditch and Marsh Water

One ordinarily would not think of using for drink water, but the war of 1861-65 placed our soldiers where they could get nothing else at times. (It has been said that they would drink from puddles.) As before noted, they got good water by driven tube wells, so that this part of our subject may be referred to well water, *and we will say only a few words more as to these tube wells;* they are too well known to need description; they are driven so deep, or should be, that all water entering them by the pressure of the atmosphere working through the earth is filtered like spring water, so that all the insoluble impurities are left behind in the stagnant pool, ditch, or marsh. If one doubts the presence of animal and vegetable life in pools, ditches or marshes, he has only to gather a handful of their weeds, algæ, etc., squeeze their drip into a tumbler and then study under the microscope; all the microscopic plants and animals found in ponds are in excess in pools, ditches and marshes; a bag made of cotton cloth will filter such water if kept from overloading; so that in the absence of driven wells, cotton may be used as filters for emergencies; the water may be surely clarified by running through the cotton filter three or four times. Cattle drink from pools, ditches and marshes with apparent impunity—but where is the man that eats grass like cattle?

Drink Fit Water in Sandy Deserts

In 1854, the senior writer walked from Wellfleet to Provincetown, on the outer shore of Cape Cod, until the end was nearly reached; he was in company with his old Warren Academy teacher, the Rev. A. P. Chute, who sought shells; the walk was very tedious, the feet sinking up to the ankles at every step in the sand; after much toil and tire, Highland Light neighborhood was reached unknowingly in the fog; seemingly there was nothing but the sea to drink; finally the senior writer thought of the interesting narrative of the sailors wrecked on the sandy coasts of Africa, who got water fresh and good by scraping away a shallow pit in the sand at the lowest angle where the sides of two sand hills met; this was done; soon the excavation filled with murky water some three inches deep, which was found sweet, cool, refreshing; a tube well driven there would probably have given a rich supply of clear water. This leads to a brief consideration of

Artesian Well Water

This comes from wells bored deep into the earth; one of these was early dug in Louisville, Ky., about three thousand feet deep. These wells go through rock and everything; the water is not always drinkable; the above well, when the senior writer tested it some forty years ago, was too salt to drink save as a medicine. At the present, there are more artesian wells in use than ever was dreamed of—but the getting of good artesian well water is something of a matter of chance; it is said that the French Government is making the Desert of Sahara bloom with oases about deep artesian wells. The chief objection is the tendency to be laden with salts.

Spring Water

Runs of itself from the ground into the air; or from under water as in Nevada. This classification applies to springs that can be used for domestic purposes like iron water. In almost every locality where man lives, in city, town or country, there are springs. In Plymouth, Mass., there are now two such springs used; one is small and the other so copious that it runs in a good-sized stream along the paved gutter of the chief street. A poetical spring is mountain, located away from the haunts of man, bubbling gently out its cool refreshing waters, which exposed to the air have generally no fungous life but only the innocent algæ that throw off the life giving oxygen gas. There is flavor, zest and satisfaction in a typical spring water, which is a type of the best natural drinking water. A curious thing about some springs is that they issue from mountain tops; one is on Mt. Monadnock, Massachusetts; there is no higher site within range of vision; the idea was impressed that it came by the earth's centrifugal force; the filtering of the water was thorough. Springs in cities and towns are subject to the same objections as wells. The deteriorated character of the above Plymouth springs proves this.

Sweet or fresh springs rise under salt water. Such are found often on the shores of Buzzard's Bay. Again, at Echo Lake, Nevada, which is made up of cold snow water, there are hot springs bubbling up from beneath. Some springs contain more salts than are healthy for man; one advertised water has 480 grains (one ounce) of salts to the gallon; this is not water fit to drink; there is no need of producing calculi or gravel in the body; no doubt an excellent purgative, but not for regular drinking. Some springs contain a fit amount of salts; one in Southern Pines, N. C., with less than two grains to the gallon; any spring water with less than ten grains of solid matter to the gallon is recommended. *All springs are mineral,* but this term means, in common usage, waters where salts and gases are in great abundance; they might be called saline or salt springs, but such come under the undrinkable.

Cooling mountain streams are practically spring water. Sometimes they are ice water from beds of ice deposited in the intervales of mountains, shaded from the sun and protected from the wind; there is one such in Southington, Conn., the year around.

It is said that Alexander the Great had wagons laden with spring water carried in silver casks or barrels—that he drank no other water. It is a common thing that many people are made ill by drinking the waters of places where they have never been before—a good argument for aerated distilled water.

River Water

Differs from well water in having less mineral matter and more animal and plant life. As it is less filtered and from a larger watershed, it is more affected by the sources of pollution. River water has more chances of self-purification than well water by the algæ. Also because of the animal life, the crustacea, the monads, the infusoria, bacteria, which are common in said water; our instincts tell us that such are injurious, but their direct badness has not been proved, simply because no one has studied them alone and because millions of people drink them down in cities and towns and no increase in the death rate has been found; the late Prof. Joseph Leidy, of Philadelphia, used to drink purposely, water filled with infusoria and no harm followed; and this is an open question modified by the constitutional condition of the drinkers on the general principle that we live surrounded by the causes of disease (predisposing) which do not become exciting causes, because of the good health resisting and overcoming them; hence if some strong men have drank infusoria harmlessly, it does not follow that weak and feeble men can do so likewise; some live in spite of their surroundings, but most depend on them for their existence. So the safest way is to follow instinct and have the river water filtered for drink, until science tells us clearly that instinct is wrong, for it is not always right.

Some think visible fish, reptiles, worms, insects and other animals harm river water. Frogs and trout are put into springs and wells to keep the water pure. The consideration here is out of place, as said animals are not found in potable water as a rule. It is averred that snakes and worms are drunk and developed within the stomachs of man. We know worms are found in the stomach; years ago it was said that every one in three had internal worms, specially children; the round worm may come from the common earth worm washed into the river and drank thoughtlessly; the anguilulla found in vinegar is common in river water. But as to snakes so far as the writers know, no well authenticated cases are recorded; though among the southern negroes, who have strong convictions on the subject, cures by physicians have been made, but the snake or lizard exhibited to the patient was procured from the outside. It is always best for one to inspect and also notice the taste of whatever water one drinks, as the chances of introducing bad things are thereby lessened.

Formerly it was considered the best form to take hydrant water from rivers; but as cities and towns grow, the rivers are defiled with sewerage and the refuse of manufactories. Any one who inspects the Passaic river above Newark, N. J., can with eye and nose get evidence enough, that it is too filthy to be used as drink water—the fish are even killed and black deposits are seen on the margins of the shores. Philadelphia has long used the Schuylkill river water; in 1854, it looked so filthy that a newcomer rather objected to drinking it; the authorities said it was simply the clay suspended and harmless, also the carbonate of lead deposited on the inside of the house service pipes was insoluble and protective when once formed; and this did seem practically true; later, about 1880, an examination of the forms to be found in the Schuylkill showed less clay and fewer plants and animals than any other hydrant water of some thirty cities and towns.

The form of disease found to be the most commonly traced to river water (thanks to our excellent Boards of

Health), is typhoid fever. For example: Camden, opposite Philadelphia on the Delaware river, for the part, took its water from the Delaware river, a very much larger and deeper river than the Schuylkill, but the death rate from typhoid was so great that they wisely drove wells in or near the river to a great depth of filtration, which gave a pure water. About January, 1898, the supply ran short, so that water had to be added from the Delaware; within two weeks 176 new cases were reported of typhoid; this roused the Board of Health; measures were taken to stop the waste from faucets kept running to prevent freezing; the filtered water was then ample and only fourteen new cases of typhoid fever were reported in the next two weeks.

The report on filtration of the water supply of New York, by Dr. Thomas Darlington, Commissioner of Health, July, 1905, is most important as to typhoid fever and should be noted by every drinker of Croton water. It asks for filtration plants on the grounds that sand filtration is no longer an experiment, as it removes 99½ per cent. of bacteria (the germ of typhoid) and most of the organic and inorganic forms of life—that it has been used in Europe for 75 years—that in Lawrence, Mass., and Ithaca, New York, it has largely decreased deaths from typhoid and diarrhœa—that in Ithaca 10 per cent. of the inhabitants had typhoid from drinking unfiltered water and that since filtration, not a case has been found among those who drink from the mains, but "numerous cases have been found among those who still use shallow wells"—that in West Philadelphia (1905, Jan. 6 to April 28), the weekly percentage reduction of typhoid cases, comparing a population of 41,424, having filtration with 140,517 with no filtration varied from 100 per cent. to 6.73—that Berlin unfiltered 1843-52 had one case of typhoid to 1,000 population, while filtered, 1891-1900, there was one case to 10,000—that in Magdeburg, from 1831-85, one in 1,000 unfiltered and 1891-95 one in 10,000 filtered—that in Breslau, 1867-73, one in 4,000 unfiltered, and 1896-1900 one in 10,000 filtered—that in Hanover, 1874-78, one in 1,000 unfiltered, and 1896-1900 one in 10,000 filtered—that in Hamburg, 1887-93, one in 3,000 unfiltered, and one in 10,000 filtered—that during the cholera epidemic of 1892 Hamburg used the Elbe water and had 2,000 cases; while Altona filtered it and had 138 domestic cases.

River water can be easily filtered at home by making bags of cotton cloth, muslin, cheese cloth and cotton wool and changing often; if the filtered matters accumulate, so as to form a thick layer, the clear water will cease to ooze and small holes in the bag will be bored through, the water projecting in small streams; then stop the process, renew bag and use till the same deterioration occurs and so on. The great trouble with all filters is the need of frequent changing.

It is not possible that rivers in civilization will ever become the source of drink fit water while the present system of sanitary arrangements and manufactory pollution exists. The remedy for this is to utilize for fertilizers the present sewerage flowing into rivers.

According to the late Ernest Hart, M.D., editor of the *British Medical Journal* for many years, the evidence is conclusive that cholera is a water borne disease.

Water of great rivers! The story is told of a ship's crew out of water along the coast of South America; the dearth was signalled to a ship hove in sight; the reply was, "Dip your buckets overboard;" they did so and found fresh water of the Amazon. This stream is so large that it flows a long way before it mingles with the ocean. The denizens of the Missouri and Mississippi valley drink the river water.

Pond or Lake Water

Is much used for cities and towns; (dams are ponds) and special attention is needed to be paid to it as it differs from rivers in being still if not stagnant—in having a smaller water shed or surface of natural drainage—in location in places sometimes so high that rivers could not be there; in not being subject to defilement by sewerage to the extent of rivers and in being more easily kept pure. Boards of Health have pronounced them the purest of waters and there is no reason to doubt this opinion. Lake Tahoe (California), is snow water or frozen rain thawed; it has few if any sources of defilement and is so pure that its color is as blue ink; a boat sailing on it seems to be in a sea of azure fluid; the water is clear as crystal and the bottom distinctly seen within an estimated depth of one hundred feet; vision when flat on the deck of the steamer's prow was as if one looked into a tunnel of water one hundred feet deep; Lake Tahoe would be an ideal source of water supply for San Francisco.

"*Pure Water is Sky Blue.* (*From L'Illustration.*)—"After long hesitation scientific men agree to-day in admitting that water physically pure, seen in mass, is sky blue. This color is that taken by the white light of the sun when absorbed by the water, in consequence of a phenomenon the explanation of which would be a little long.

"It is not due to the chemical purity of the water, since the sea (which is the bluest water) is also that which contains the most salt. Nevertheless, according to Forel's experiments, the matter in solution should be the predominant cause of the modification of color, upon which act, besides the matter in suspension, the color of the bottom and the reflection of the sky and of the banks. Consequently blue water is pretty rare in nature; a good many seas and lakes that give us the impression of this tint are green.

"The water at present acknowledged to be the bluest is that of the Sargasso Sea, between the Cape Verde Islands and the Antilles. The water of the Mediterranean off the French coast and around Capri is bluer than that of Lake Leman, much less blue itself than that of the lakes of Kandersteg and Arolla, in Switzerland. Pure water containing a millionth of ferric hydrate appears brown under a thickness of six metres; a ten-millionth is sufficient for it to be green; and in order that it may remain blue is needed less than a twenty-millionth."

Long Pond, Falmouth, Mass., is justly regarded as a very pure water supply; it is away from dwellings and its waters do not have the average quantity of microscopic plants and animals.

Animal and vegetable life is abundant in pond waters, so much so, that it has been called a "botanical and zoological garden." Thirty years ago, when Prof. Paulus F. Reinsch, of Erlangen, Germany, and the senior writer studied the forms of life in the Cochituate, Fresh Pond, Mystic and Croton waters, it was found that an average collection of any of these waters contained about forty animals, plants or organic substances that could be named, while there were as many that had no names.*

The chief incitement to these investigations was to study biology, botanical and animal; to get a list of the inhabitants of the pond water, so as to know what people were drinking; to find out the food relation of such fauna and flora from a medical point of view and specially to ascertain what was the cause of the particularly bad odor or taste of the Cochituate water at certain seasons of the year. An historical memorandum is here necessary and is written in the first person by the senior writer:

* Here is an opportunity for students to distinguish themselves by completing the list; there is little competition.

"Prof. Paulus F. Reinsch, of Erlangen, Germany, was introduced to me by the late Prof. Sereno Watson, of Harvard University, in 1876 (when I went there to find out if the algæ of Fresh Pond, Cambridge, had been studied and learned that they had not), as 'a man who is the best living algologist in the world; he can tell you what you want.' This testimony has been confirmed; Professor Reinsch is known for his vast additions to the knowledge of cryptogamic (flowerless) botany, extant and fossil (*see* Smithsonian Institute); I became the pupil of the Professor and we studied the morphology (morphos—form, logos—account) of the Cochituate and Fresh Pond waters—with as much zest and interest as college boys play football; we found always an abundance of animals of the lobster family; those shelled animals whose lungs are in the feet; those who have no trunk nor limbs, but who make them at will, make new stomachs every time they eat and divide themselves up into several new ones; animals that build around their body substance a stone wall of minute boulders and who bore into larger animals with the edges of their stone house, shaped much like a baked bean pot; diatoms that move at will like animals—apply themselves into a hoop and into beautiful star-like objects; animals who act as scavengers or undertakers to get rid of dead creatures; animals which under polarized light rival the glories of polarized salicin, chlorate of potash or ice; besides, plants shaped like dumb bells, or half dollars with milled face and edges—like the new moon —like bundles of faggots—like triangles—like transparent rods jointed as fish poles and with green contents disposed in single or double spirals; plants all of them rootless, branchless, free floating, unfixed in fronds, bunches, sometimes in large transparent protoplasmic globes provided with regular and symmetrical green spots (gonia), provided with eyelashes that move together so that the plant (volvox) majestically rolls hither and thither at will—plants that are made of long green cylinders cross marked—that crook and bend backwards and forwards, sometimes very slowly, but sometimes quickly (like lashing) and which will crawl out of the mass in a tumbler and range themselves in rings on the inside glass just above the surface—plants that are crooked like spiral springs—that are laid out in beautiful mats deeply slashed but exquisitely balanced, one side against another, rivalling the most elegant lace work, to name no more; thus in search of biologic truth in pond water, we had a feast of eye music that delighted our souls. We were on the lookout for the causes of defilement, when surprised with so much eye delight, but did not seem to strike it; one day I asked the professor what the spicules of sponges pointed at both ends, finer than the finest needles, polished perfect, some entirely smooth, some dotted with little secondary spines, came from? He replied, from sponges which were made of protoplasmic substance, having no more strength than a jelly and that these spicules stretched like skewers, and, he might have added, built up a skeleton framework in which the jelly sponge is held and protected; indeed, since then I have seen several sponge spicules partially enveloped by the protoplasmic substance; at the time he pointed out the spicules, I did not know that there were fresh water sponges save very small ones, almost microscopic. I asked if there ought not to be large visible sponges in fresh water? He said, 'Yes,' and we sought for them specially in the Charles River, at the Needham Dam, near Wellesley; all we found were some very insignificant ones so small as to be unsatisfactory; as we looked at all the pond water plants and animals with a view to the cause of the Cochituate pollution, so the sponges were questioned; still their insignificance did not point to any causal relation to the awful odor and taste; a guest of the late W. R. Baker of the Wellesley

Hotel, I made a careful study of the Charles River; one day at the hotel landing I noticed a green rod three feet long and perhaps five-eighths of an inch thick, with longitudinal angles running parallel, lying in the water, next the wharf where it joined the bank; reaching over, I was surprised to find it like a cactus with a crackly feel, that I had noticed in sponges uncleaned in the market; immediately the evidence given by this crackly feel made me cry out, 'I have found those sponges that we sought in vain almost.' Taken to the room and studied under the microscope the sponge spicules were found in their natural place; I left a section of the sponge stalk in water in a tumbler over night; *in the morning the room was filled with the bad odor of Cochituate water: the odor and taste are alike; it is the odor of fish worms kept too long in earth in a tin box. Here was the problem of the dead, fishy, earth-wormy, taste and smell of the Cochituate solved to be dead sponge protoplasmic substance!* The search was made for big sponges in the Charles River and masses of clustered cylindrical sponges were found large enough to fill a bushel basket; afterwards an employee said he had seen plots of such sponges now that he knew what they were; Prof. Reinsch and myself brought sponges to the Boston Water Board, that were collected from the Charles River; a collection was also sent to and received by the Sponge Museum at Liverpool, England; to show that this was a real discovery, later the Boston Water Board employed Prof. Remsen, of Baltimore, to investigate; the Board reported that he was the discoverer that sponges were the cause of pollution of the Cochituate water; while it is difficult to see how old Father Time can be operated on to make a year behind precede the year before and give priority still the result has been most happy in a food way; the Boston public were roused to their need of purer water and means were used so that now the forms of life in the Cochituate are fewer, the fresh water sponges are gone and the city also abounds with pure filtered or spring or distilled water. It may be added that the New York Croton Dam has also been improved; when every scholar is taught how to use the microscope as piano use is taught, the blundering that allows of water food pollution will not flourish."

To repeat: The best way to get pure water from ponds is by driven wells either on the margins or better out in the middle, one hundred feet deep in the earth below the pond. It is practicable.

Horn Pond water litigation: The town of Woburn, Mass., in digging a filtering well (about fifty feet long, fifteen feet wide and deep), one hundred feet from Horn Pond, in very small boulders, found eight feet below the pond level, clear water; in the charter of the water company or town, the mill owners' rights were provided for, if the water "was taken from Horn Pond;" the town, sued by the millers, whose water was cut down, claimed that the water was not taken from the pond, but on its way to the pond; the senior writer was called for the millers' side; previously his attention had been arrested by this filtering-well water said to be the purest and with this view he examined it; the first specimen yielded over sixty organic and inorganic forms; so it could not be the purest; had it been well or spring water it would not have yielded such a zoological and botanical garden; then a comparative examination was made of water from the pond off the shore of the well site and also of water drawn directly from the well by buckets; it was stated on oath in court that both waters had a like morphology, but that of the well was less abundant —that the forms of life were not those found in wells— that if they were well water forms, the student had made a discovery that would rank him among the greatest scientists— that among other things a red colored water fungus, which

Professor Reinsch said was new to science was present in both waters, also polycocci, scenedesmus quaudricauda, cyclops, spicules of sponges, algæ, etc.; that the witness had no opinion as to the well being Horn Pond water any more than he had that a chandelier in the court room was a chandelier. The award to the plaintiff was double that made previously in a like suit.

Remarks: This legal aspect may seem out of place here, but surely the conduct of this suit furnished food for the lawyers and shows some of the difficulties placed in the way of pond water, when furnished as food, by litigation which had been guarded against as much as possible in previous legislation; *the interests now are so great in pond water for city and town use, that the money value of ponds has vastly increased, the procuration and maintenance of pure pond water are now a gigantic business, and the magnitude of water works has far excelled any of the expectations of the first engineers; Beacon Hill (Boston) reservoir, built to last for ages, has within the time of the senior writer become so inadequate that it has been torn down and the State House extended over its site.*

Besides clearing mud and weeds and other growths from ponds, it is necessary to keep the pond at one level, so that there will be no exposed wet littorals; the sponges, pelomyxas, rhizopods and other animals die in the air, their bodies decompose, and when the water rises and covers their place (habitat) it dissolves out the soluble dead decaying protoplasm and hence the bad odor and taste; keeping the ponds full also helps to prevent mosquitoes, as clean cut banks with no extremely shallow areas allow the killing of the mosquitoes in their larval stage by small fish.

In these studies with Professor Reinsch it was learned that the plants and animals could be found the year round and not alone in the summer, as he had previously taught;

also that the same plants and animals could be found in the surface water of ponds even in the middle by collecting with a cotton bag attached to a common glass chimney.

Humus or humic acid which stains pond water does no harm; the *natural tendency of pond water accidentally fouled is to purify itself,* but it takes time, light, air, motion; in all probability pond waters used as food for municipalities would purify themselves if they could have a chance—but the consumption is so great that it is wonderful they are as pure as they are.

Fish and fowl help to purify pond water, but probably the sponges, algæ, pelomyxas, etc., do a great deal more. Later a history will be given of what happens to a collection of pond life stagnant in a tumbler that will explain this; but there is such a thing as overwhelming the purifying powers of nature's arrangements because of the multitude of the people.

Our Government should institute as complete a list of plants and animals in ponds as possible; the work is too great for individuals; it might be done by States if not the United States; already some of our State Boards of Health have gone into it well; there is no reason why there should not be a census of the ordinary invisible beings in ponds as there is a census of the inhabitants human.

Hydrant Waters

The term was first used by Professor Reinsch to designate the waters of towns, cities and municipalities which are drawn through a hydrant; it includes all the kinds of waters here named. A peculiarity of hydrant water is the settling in closed pipes or cul de sacs or joints so profuse as almost to clog the pipes, requiring slushing through the hydrants, astonishing observers with the copious abundance of its filth. Hydrant pipes deteriorate by use, depending on the material and the way it is put together; the best material is probably Russia sheet iron pipes lined outside and inside with Roman cement; an example is seen in Woburn, Mass., where the Horn Pond water has a pressure of some seventy pounds to the square inch; these pipes have been in use over thirty years and so far have not even given out; practically they are cement pipes. The common material used for hydrant water pipes is cast iron; they rust out for several reasons: (*a*) the galvanic currents in the earth; (*b*) making *per se* a galvanic battery which, excited by the water (hydric acid) rapidly eats itself away and then leaks. Some forty years ago the senior writer visited New York and his attention was arrested by some of the four or five feet in diameter water mains that were exposed; one section showed a dam or barrier of carbonate of iron stretching across so that half the caliber was blocked; he took hold and found its resistance to be great; this was galvanism with a vengeance; how it was done was a wonder to the observer until some ten years later it was explained and the means of prevention stated by a New York foundryman as follows: that the pipes were cast horizontally; the iron of a transverse half section below was weighted with the molten iron of the upper section so that in cooling, the lower section weighed more, was more compact in structure than the upper section, and when the pipe was full of water there was the excitation of a huge battery, one plate being the section above, the other plate the section below; to prove this, the pipes were cast in a vertical position which made the same condition even more exaggerated, but the fact that the density of a cross section was uniform, stopped the galvanic action and the pipes were no longer dammed by the carbonate of iron; iron in water is not necessarily poisonous, but in the instance above it was mechanically obliterating the caliber of the pipe.

Lead pipes for hydrant water: Some waters deposit marble on the inside of lead pipes when outside of the earth; such a condition is practically harmless; the danger of lead pipes is in the ground fluids forming with the inside water, a galvanic battery to produce soluble salts of lead, which may poison the hydrant water; it is an impression that cases of lead poisoning from hydrant pipes are far less common than when under ground laid pipes convey water from wells for domestic uses.

Common tin coffee pots are liable to poison hydrant water, specially when the solder made of tin and lead dissolves off by use, so that the pots leak and the tinsmiths repair said leaks by more lead and tin (solder).

Fish are a detriment to hydrant water in pipes, but not in the reservoirs.

On the whole, hydrant water is far better than well water. It is possible that one element in the lengthening of the average of life may be the use of hydrant water. Modern water works must be deemed a blessing. Hydrant water means as to health less diseases of the gravel or stone kind, as rheumatism, asthma, gallstones, etc., simply because there is a less amount of salines in hydrant as compared with well water.

Ship Water

Formerly was quite bad water. The late Benjamin L. Cutter, 1828-1851, who went a whaling in the Pacific Ocean about 1845, said that it was bad tasting and looking and presented masses of ropy adhesive gelatinous glue-like matters, which nowadays is known as protoplasmic or colloid; a personal examination aboard ship, confirmed the statement; its explanation came many years later, in 1882, when one summer finding the wooden set tubs (then in use) shrinking by drying, water was kept in them to filling; in a few weeks, large masses of ropy, adhesive, dirty, gluey, jelly formed on the walls of the tub, taking up about one-fifth of the space. At first the senior writer thought here was a colony or polypdom of the Alcyonella stagnorum, which he had before seen in a mill pond at Bedford, Mass., where the polypdoms covered the water side of the flash boards of the overflow dam in masses big enough to fill a bushel basket; but on close examination no eggs were found armed with anchors—no plumatose tentacles expanding like a lady's parasol, instead the masses were a collection of vinegar plants known as mother of vinegar; the volume was very great; the water smelt and looked just as ship water had been described over thirty years before and here is the explanation: The vinegar yeast spores present in the air as aforesaid get into the water no matter where collected; if it is the ordinary pond water, it has contained some eighty forms of animal and vegetable life; shut up stagnant most of the plants and animals die; on their dead remains, feed the vinegar yeast spores and there develops the gelatinous stage, which is known as mother of vinegar; it is our impression that these changes go on faster in wood than in iron tanks; it used to be said that this ship water after many months would clear itself; no doubt of it; even the mother of vinegar disappears, but leaves behind a bitter taste: the water is then much better to drink than when it was a zoological and botanical garden.

This purifying process of dead ship water may be studied near at hand; filter hydrant water through a cotton bag about one and one-half by four inches, with as gentle a pressure as pososible; when the water begins to bore through in jets, stop flow; remove bag, empty into a goblet, turn bag inside out and sop in goblet a short time; squeeze bag by twisting; with a pipette remove specimens on to slide and cover; or, better, have a slide with an open cell, two by two-thirds inch, one-eighth inch deep, and place specimen on horizontal stage; one inch, one-quarter to one-tenth inch objectives; let specimen stand for a week or ten days and study it daily. In brief, it may be said that at the first day the lobster family, the rotifers, rhizopods, pelomyxas, anguillulas, infusoria, the algæ and the fungi are all in fine order—that the next day many of the animals will be dead—next day, monads, vibriones and greedy infusoria will appear for the first time in abundance; you wonder how they come and have a feeling that nature sends them as undertakers to care for the dead forms of life which otherwise would make a worse charnel house of the ship water than even now; these monads and infusorial undertakers act with great vim and energy, a little monad hardly visible will take a dead chetochilus (lobster family) and violently yank and tug it off better than a tow boat does a big ship; no visible means of propulsion are seen in the monads, making their automobile work more wonderful; the infusoria all covered with vibrating cilia (hair-like feelers) also are very active; they explore the dead with a view to getting inside the ring and when they get there, they feast as if they had a better pull than any of the politicians—indeed they eat up all, so that the outside skeleton is clean as transparent glass, making a fine preparation for the microscope which looks through rather than on the surface of things; the senior writer has seen so many of these anatomically clean skeletons as to make winrows on a lee shore of Spy Pond, Arlington, Mass., visible for hundreds of feet away; after the monads and paramecial infusoria finish their work they disappear, a wonderful provision of Nature to remove animal agents—then the fungi (yeasts) speedily take up the labor and decompose what vegetable matter dead or dying that may be present and here comes in the vinegar plant or mother of vinegar; when this process is over, there are blackened remains and bitter smell and taste, but less harmful than the first stage of dead things, as the sailor experience proves; not all animals and plants are destroyed; the cyclops will live for months if not years in a stagnant collection of water; also the oscillatoriaceæ, which bend and lash themselves, will often survive—but probably all the poisonous forms are disposed of.

Ship water is better now, as we have in our own voyages found splendid water; *some of it is distilled;* the U. S. Government has now ships on purpose to distill water from the ocean; this is admirable and fine; Rear-Admiral Charles Stuart Norton, when in command of the South Atlantic squadron, 1894-96, at Rio de Janeiro, distilled water especially for bathing and ship washing, with the result of an unusually healthy command; again, a few years ago, on visiting Gloucester to see the character of the water on the fishing schooners, the observer found those of the Thomas Hodge Company provided with an excellent water supply taken from the city hydrant water. Our sailors doubtless get now the best water ever had by them; in case of shipwreck, water can be procured by distilling if there are wash boilers and means of heating the sea water (*see* Distilled water).

Worms live longer than other animals in water; once called to test a spring water, which was in bung casks, the observer found when the bungs were knocked out that underneath were a number of two and three inch worms, yellow jointed like armor and bristly with points; they were after the air near the bung; the gentleman who wished a certificate as to the purity of this spring water (kept as on ship-board) was told that further examination could not be made; it did not need a microscope to see that here was gross carelessness in putting up this water. One should never forget that in cotton cloth we have good filters everywhere present among civilized mankind,

Cold Water

Is used when we are hot with fever or action or warm weather, at a temperature of from forty-five degrees Fahrenheit to fifty-five degrees or to the temperature of living rooms; it is neither hot, luke-warm or iced; it cools, but does not chill; tempers and refreshes; does not paralyze the action of the intestines; it is *the temperature of the cool spring water that many long for,* especially the sick; it is possible to drink too much cold water; there must be reason used, but the dangers are far less than with ice water. Thirst is generally a good sign for cold water, when reasonable; the solar plexus of nerves knows when the normal dilution of the blood is not present and sets up the feeling of thirst that may be the most terrible instrument of human anguish; cool or cold water slakes thirst the best and all its environments of gratified sense prove it because the relief is so prompt, energetic, sure.

A mineral food, it perfectly satisfies certain physical wants, because the processes of absorption (osmosis) digestion, elimination, dilution of blood and all secretions, to healthy point are not checked nor hindered; they are rather instituted, set in motion, pushed to full extent; a curious thing happens if an excess of cold water is drank (but not to the point of chilling nor paralyzing), in the beautiful self-action of the abdominal nerve governors; immediately the kidneys go actively to work to carry off this excess and a free flow of limpid low specific gravity urine passes off; also it goes off by the skin in sweat and in watery discharges by the bowels; we seem to be better provided for in the matter of excess than of diminution of cold water, because nature needs something to work with; this action is seen after an ordinary meal; the urine is always paler, of low specific gravity and freer from abnormal forms; hence an examination of such urine is sometimes fallacious.

A good way to procure cold water is by putting pure water into bottles and placing them in the common refrigerator containing ice; the water is then much like spring water for coolness; we wish that all table cold waters were thus prepared.

Cold water may be used at all times when common sense rules. Mankind is united as to the use of cold water in fevers more at present than formerly. It is within the recollection of persons now living that cold water was denied to those sick of fever; but even then there were some that used it; the late Dr. Benjamin Cutter always gave cold water in fevers; in his library were three vellum-bound Latin books made up of German inaugural medical theses published in 1729; among them was the story of a sailor very ill with fever on ship-board in a fresh water harbor; he begged for cold water to drink; denied as it was thought sure death! However, one night he escaped his guard and jumping overboard, drank all the cold water he wanted; by this time, he was rescued and instead of being dead, next morning was better and was cured speedily; the water in this case was probably up to 60° F.; in the present day of laboratory investigation and non-reliance on any one's saying, it is to be hoped that cold water will be freely used for the sick unless proved by actual test harmful.

Ice Water

Is that cooled by ice melting in it, though it takes time to bring cold water to 32° F. People differ as to its being injurious; (in Europe, an ice cart even in summer is a rarity); Americans whose cities abound in ice carts thus say it is not; a city or town home in America without a refrigerator is not a home.

Doctors of medicine must decide this question. Judging from a long acquaintance with the use of ice water as a drink, the writers must beg to differ with the European assertion and at the same time not agree that it is wholly innocent; the conventional usage in sickness is to give ice water; but where the vitality is low in chronic cases of organic disease, no doubt the dynamis required to bring the body parts that come in contact with the ice water up to normality is a loss, that cannot be allowed by the judicious physician, who is trying to save up all the body force possible to combat the disease. The moderate use of ice water by the healthy overheated and thirsty is advisable with reason; there are records of deaths from drinking ice water, but these were cases of overheating with overdrinking ice water and also often with the addition of overeating. The intense cold paralyzed, so that the nerves were overwhelmed. Ice held on the skin long enough makes it numb, so that it can be cut without sensation. Much of the same occurs in the stomach when ice water is drank. If the quantity is small, the reaction readily restores healthy function—the easier if within a certain limit the body is overheated—but in an excessive overheating and excessive ice watering, nature perishes in the attempt to rescue—her forces are overcome and the patient dies; another element is the putting in of several foods into the stomach which, undigested, speedily ferment into paralyzing gases. So then to repeat, the Europeans are correct in part as ice water kills sometimes; and Americans should heed this. We think they are heeding it, as there are few reports lately of death from ice water. Our desire is that it be used moderately; later we will show how ice water becomes distasteful as a daily beverage. We think that if Europeans used ice water moderately, they would be better off than now, with their wines and liquors. Not long ago, a butcher locked up in his refrigerator, was taken out dead. Life cannot go on at 32°

F.; between this and 99° F. the healthy temperature of the human is the chasm between death and life. If the temperature is over 99° F. it may be well to reduce it by ice water, and this is what is done in sickness or overheating by exertion. But the body will not exist in health with much less internal temperature than 99° F.; people do live in an atmosphere at 40° below zero F., but this is not the body temperature, which otherwise would be frozen stiff. There seems to be somewhat of an ice water habit; all the good attained by using ice water could be had by cooling water in refrigerators as before noted.

Ice water as a local application: Some years ago, a carpenter fell down into an open cellar of a mansion of which he was the builder; the fall resulted in a compound displacement of one of the small bones of the wrist (the trapezium), and it was thought best to remove it; being hot weather, special precautions were used by his medical attendant to prevent gangrene; an irrigation apparatus was made whereby small streams of ice water washed the parts; the patient felt relieved, but the hand and the whole forearm irrigated, became just what was guarded against, gangrenously rotted; the man died; judging by this case, outside application of ice water proved the death of the limb irrigated and of the whole body. Lately another case came to our knowledge, where ice cold applications for extensive bruises jeopardized the patient's life, and only by swift interference and change of dressings another might have been lost. The relief by numbness did not hinder the process of death of the tissues in the first case, while the nervous system could give no warnings. Numb the nerves of the stomach by ice water and disaster may come unawares, because pain, the natural guardian and warner of trouble, is abolished. "No pain no disease" is not an axiom here.

Ice

Is water in solid form, which has the curious and uncustomary property of taking more space than in liquid form. Most substances are smaller in solid than in liquid state; ice floats; average crystals (solids) sink in fluids; salt settles to the bottom of its solution. Were it not for this, there would be no need of books on food, as neither food nor man could exist on earth because all seas, lakes, etc., would be frozen solid.

Ice is most useful in cases of fever—also in cases of difficult swallowing; ice-cream can be eaten when nothing else can; the cooling of the inflamed throat and the lubrication even in organic disease will let a patient swallow when it was impossible before. Ice is used to cool air food; of its efficiency, one of the writers saw a demonstration at the civic reception given at Potsdam in 1890 to the Tenth International Medical Congress; four to six tons of ice were exposed in two piles on raised platforms; thus the air food was refreshed, as there was a constant circulation, the ice-cooled atmosphere giving place to the heated air; dust was also left on the ice, further purifying the room; the best effect would have resulted if the ice had been placed near the upper ceiling, but all present were grateful for the thoughtfulness of the entertainers. (The ammonia process is now much used in cooling air food.) The lowest temperature ice is formed at, is the degree of cold it takes and holds; American ice is regarded as furnishing pound by pound more cold than English. Machine ice in Louisiana is claimed to be less cool than ice from the North. A curious fact about snow is that in Alaska newcomers cannot take it as drink (melted in the mouth), as it would be fatal; probably due to the enormous consumption of latent heat in melting one unit of snow, requiring seven hundred units of heat. Reindeers and Esquimaux dogs eat it and perhaps man could, if brought up to it from infancy like said animals. But the force of these words may be better appreciated, when it is said that roughly one pail of snow requires seven hundred pails of heat to melt it.

Snow water, Boston, March, 1902, showed a great abundance of alcohol yeast plants. The gases found in ice are air and oxygen from algæ. The lower the temperature of freezing and the larger the mass, the less air bubbles. Even snow by great pressure becomes solid and clear as glass as glaciers evidence. Ice will keep organic substances without change, as shown by the remains of a mammoth, found entombed and enveloped in an iceberg or glacier in Siberia or North Russia some years ago. Muscles were in such perfection that some were taken to London and a dinner of the meat was cooked and eaten by scientific men. And it was said that the meat was fine, though it had been *iced* for three thousand years and probably longer.

Ice and germ life: Over forty years ago the senior writer used to vaccinate cattle in such cold weather that the vaccine would be frozen in the stables and barns. Yet the cattle would take the vaccination; no doubt germs cannot develop in ice at or below 32° F., but this does not kill them so that they will not develop in a higher temperature. People should not depend upon ice to kill germs—boiling is the best to do it.

Forms of life in ice: In the *Scientific American,* July 29, 1882, is a paper by the senior writer on this subject, probably the first published. In it is shown that quite a list of the plants and animals of fresh water were found in the commercial ice furnished in New York City and also that in the process of melting on the way to consumers, there was a great collection of the organic and inorganic forms that are found in the morphology of the air. In one instance a block of ice on a cart was so covered with substances from the impact air that the ice surface was almost as black as ink. So far as removing aerial foreign bodies is concerned, the ice that cooled the said Potsdam reception is a fine contrivance. And a very good way to test the morphology of air is to expose a piece of ice and let it melt, provided you know the morphology of the ice used.

Lukewarm Water

Is interesting; its temperature is 107° F. and its law is to reverse peristalsis, the worm-like movement of the stomach and intestines that goes on in twists and waves and naturally downward from the stomach. (The ancient soothsayers understood this; the classics are full of allusions to the study of the intestinal movements of live animals with abdomen cut open and exposed: specially done when war was to be made.) Sacred writ also shows that lukewarm water excites vomiting, that is, it is a good emetic to relieve an overloaded, full or poisoned stomach. It should be much more used at this time.

Hot Water

Is that heated to the temperature of tea or coffee as usually drank 140° F. The temperature of boiling water is 212° F., which some call "hot water"; this is a misnomer and only to obtain unfair advantage in argument. Some physicians have said that the drinking of hot water scalds the "insides"; to do this it must be 212° F.; try it and see how the protective and detective nerves of the mouth will rebel; to be consistent, those who condemn the use of hot water should never use the decoctions of tea or coffee, that are a part of the diet of all civilized nations.

A decoction is a solution in boiling water of some soluble animal or vegetable substance; the French call them ptizans and make more use of them as pharmaceutical preparations than any other nation. The good of infusions and ptizans is chiefly in the water, as there could be no such thing as infusions without cold water nor decoctions, teas, ptizans without hot water.

The chief important physiological fact as to hot water is that it makes a downward peristalsis, that is, it sets the sphincter muscles of the intestines working normally from the stomach. Sometimes when the stomach is full of gas, distended and paralyzed, hot water will cause upward peristalsis or "gulluping." (*See* Fermentation.)

Hot water causes normal peristalsis by exciting the nerves to act on the unstriped involuntary muscular fibers of the alimentary canal, so that even when distended prodigiously they will contract worm-like from above downwards and sometimes upwards; the osmosis of the water removes the local carbonic acid gas from the walls of the stomach and intestines; aromatic herbs and teas may help, but the hot water alone is able to do the whole work. There is no other medicine that will cause downward peristalsis so effectively, promptly and injuriouslessly. Dry heat outside of the abdomen does good, but not as the hot water internally. Again medicines given for specific actions are increased in force by administering with hot water.

This is not all that hot water does. It washes down and out the stomach, the intestines, liver, pancreas, kidneys, skin; it thins the thickened blood so that its capillaries and veins (there is rarely much trouble with arteries) allow of healthy flow; all the glands secrete better with a plenty of hot water; it helps to dissolve calculi, gallstones, gravel of lungs, kidneys and bowels; (sometimes the calculous intestinal concretions are enormous in size); it paves the way for good digestion, assimilation and appropriation of food and thus gives the system more force to run it happily; it becomes a spiritual food, as the spirit cannot work in a body all anæsthetized, hypnotized, if not paralyzed by the gases of the alimentary canal fermentation which are the bane of the nerves and cause troublesome dreams and hallucinations, stir up bad memories, put the sleeping spirit into a state of terrible unreal trouble; it gives a feeling of refreshment at once; leaves no trail behind; causes no abnormal appetite, nor takes away the senses, nor produces organic disease like alcohol in fatty degeneration; if habitually drank removes the desire for ice water in the hottest days in summer; in other words, it cools; distilled, it should help to arrest the formation of tartar on teeth; it warms cold extremities so that in reality it does what it is claimed that alcohol does for topers, warms in winter and cools in summer; it promotes normal sweating, an important thing for the twenty-five miles of sweat ducts in adult man; it has benefited man for ages—else why the general domestic use of decoctions. The uses of hot water as an outside application are many and various and its powers excel any medium in the materia medica; for example, it has been found in nephritic colic that baths, as hot as could be borne, cause the cartilaginous ureter to soften and with the terrible powers of the secreting kidney epithelia to expand the goose quill tube so that the calculi * were passed into the bladder; this after all the resources of anodyne and anæsthetics have been found to fail.

Boiling Water

Is that at 212° F. used in the preparation of food in cooking; while it is true that sometimes some races live on uncooked food, it is quite as true that the best type of men has to use cooking to soften and make digestible the animals and vegetables that are eaten. (*See* Changes in Food by Cooking.)

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* The size of a pea.

Water as a Chemical Substance

Contains hydrogen and oxygen of its own chemical composition and nitrogen and oxygen from the air in it. There are in water and the air it contains, enough to support life for some time, if said life force is carefully husbanded; a Doctor Tanner was once noted in New York for living on air and water for forty days; of course it depends upon the goodness of the food supplies found in the body that undergoes such fasting, cannibalizing itself; dogs have starved in forty days fed on common flour preparations, while others lived as long on nothing but water.

Summary

Water is classed by our prologue as inorganic, mineral, spiritual, suited to all, physiological, chemical, structural, next to air as a life need, a food in disease, a food for head, nerves, heart, lungs, bones, teeth, hair, etc., used often, has to do with heat, natural, climatic, æsthetic.

SALT

Sodium Chloride, NaCl: Inorganic (mineral kingdom); but present in the animal and vegetable kingdoms; also must be spiritual, as the body is not whole without it—good if used rightly—added to other foods in proper proportion is healthful—suits all parts of the body—is not a heat producer yet forceful as osmosis depends on it—climatic on sea and shore—natural—delightfully æsthetic to the taste of one deprived of normal salt in food—fashionable in all menus, written or unwritten. Dissolves readily—takes water from the air (hygroscopic)—has water of crystallization in it. Keeps the red corpuscles rounded out, distinct, separate; if withdrawn, man would die from broken up red blood corpuscles. With nitrate of silver it has been found in every tissue, as the observer learned in Professor J. P. Cooke's laboratory at Harvard, in 1853-54, and is universally present in nature as shown by the need of using distilled water for nitrate of silver solutions.

A saltless diet has been found destructive in schools of intellect; some years ago a man advocated at Andover Phillips Academy and Theological Seminary that salt and animal foods were the bane of student life and showed how much money could be saved by leaving them out of the dietary; a student returned home sick with typhoid fever who had followed this advice; he nearly died; while treating him the observer learned the cause of the epidemic to have been in the withdrawal of the meat and salt, thus allowing the typhoid poison full sway. This experience was enough and animal food and salt were put on the diet list again.

Salt may become a harm if used too much; this principle is seen in plant life. The admirable experiments of our Agricultural Experiment Stations and also common sense have shown that if plants are given an excess of manure they suffer, some being killed. Manure has been defined to be "soluble mineral plant food" and the good that is done by it, is not in the provision of chemical elements in their organic parts, but in the various salts of nutrition they contain in such a condition, that they can be absorbed by the growing plant. In humans, salt in excess disturbs the processes of osmosis in the ultimate cells of which the body is composed, which are being laid down and taken up (transformation or metabolism) all the time; when this process is retarded or impeded there comes fatty degeneration in said cells (English idea); the tissues are not nourished, they become brittle and let out the changed blood in hemorrhages, as are found in the well-known scurvy.

Thirst indicates too great excess of salts in the system.

For example, one eating salt fish, corned beef or salt ham will experience a thirst for water, due to the presence of salt in excess in the system, disturbing painfully sometimes in calling attention to the physiological unbalance.

The taste if not perverted is the right guide to eaters. During wars when salt has been cut off by the enemy, people have almost fought to obtain it; "salt licks" show that wild animals instinctively seek it; there is good reason for this. Twenty cattle were wintered with hay, feed and salt, while in the same barn were twenty other cattle on the same food, only saltless; in the spring the first set came out in health, while the saltless lost nearly all their coats of hair; as hair needs mineral food to complete its chemical elements, salt is therefore good to prevent baldness. Salt should be added to other foods if not present already in sufficient quantity.

Salt is an aesthetic in that it gives pleasure and satisfaction to eaters; the shell heaps of the whole Atlantic coast of the United States evidence the gusto, with which the aborigines ate soft-shell clams; one cannot conceive of a clam-bake being unbeautiful (unæsthetic). Why is the clam called festive? Why did the 1900 National Convention of Undertakers have a clam-bake in the cemetery at Sharon, Mass., if not pleasurable, for of all men undertakers are most careful of their ethics, and what would clams be without the salt! If this is not so, why are fresh-water clams not eaten as much as the salt? There is no menu without salt, for if not there separately it can be found in combination.

Salt is a protective against intestinal parasites, worms, etc. A child who can use plenty is generally free from worms which otherwise lodge in the intestines because the host is sick. *Salted meats are good* when fresh meats are accompanied by diarrhœa; salt in corned beef and ham makes such foods resist the fermentative vegetations in the alimentary canal better than the unsalted meat, and when a return is made to the saltless meats the latter are better digested, as the ferments have been starved out on the salted meat diet.

Salt for ages has been regarded as an aliment of the highest value; language testifies that salt was very precious when it was said of a man that he was not worth his salt. Christ, impressing his disciples with the idea that they were the best people, said not that they were the gems and gold of the world, but the salt. There are fine solid deposits of salt; specimens of same, clear as window glass, have been exhibited lately in the United States that came from Santo Domingo, where there is a mountain six miles long and three hundred feet high, made up of this beautiful transparent solid salt, deposited ages ago.

The chlorine of the hydrochloric acid of the juice secreted by the gastric follicules is furnished by salt; also the sodium of the triple phosphates and of the urates in the urine, of the glycocholate of soda in the bile, etc.

BEEF

The flesh of the slaughtered steer, cow or other adult bovine. Earle says it is curious to observe that the names of almost all animals as long as they are alive are Saxon, but when dressed and prepared for food become Norman; the Saxon hind had the charge and labor of tending and feeding them, that they might appear on the table of his Norman lord; thus ox, steer, cow are Saxon, but beef Norman; calf is Saxon, but veal Norman; sheep is Saxon, but mutton Norman. Bovines are also cattle, mentioned in Genesis, i. 29 (B. C. 4004) and in the Bible 150 times. Oxen are mentioned 136 times, so that beef goes back to the earliest history.

Bovines from the tip of the horns to the end of the tail have a money value. It is no wonder that formerly they were regarded as a money property and even now in Africa we hear of wives being bought for so many oxen. The bovines are clean animals by the Levitical law and the flesh left over in the sin offerings was eaten by the priests for food (hence they were not vegetarians).

It is interesting in this connection to see how beef was regarded in the sixteenth century in England. Cogan says of *Biefe:* "I need not show how plentiful it is throughout this land before all other countries and how necessary it is both by sea for the victualing of ships and by land for good housekeeping, in so much as that no man of honor or worship can be said to have good profession for hospitality unless there be good store of biefe in readiness; and how well it doth agree with the nature of Englishmen, the common consent of our nation doth sufficiently prove; yea, that it bringeth more strong nourishment than other meats, may plainly be perceived by the difference of strength in those that commonly feed on biefe and those that are fed with other meats." A generation ago the English were called "Beef eaters" and their success on land and sea was laid to this. It has also been asserted that when England gives up beef, her prestige goes with it. Surely after such a record, as the above reading, for 6,000 years as some reckon time, beef must be considered a food.

It is organic and inorganic: Take the loin average of analyses, the protein and fat are 38.4, ash .9.

Animal kingdom: Yes.

Mineral kingdom: Not exactly, though the loin average analysis shows 60.7 per cent. of water and said loin without said water would be inedible; the .9 ash is all of the mineral kingdom; beef has a place technically in the mineral kingdom but not vernacularly.

Mental kingdom: Beef belongs here because it furnishes all the elements necessary to sustain the spirits in a healthy condition. Go without food with severe exercise until the spirits flag and the world seems a poor place to live in; then eat a good broiled beefsteak and see how long before you get through eating, the spirits rise, the world appears to be worth living in, the morbid feelings are dissipated and you are ready for all legitimate demands made upon your brain.

Good: History has shown beef to be good and yet there are differences in the goodness as every one knows according to the cuts which our Government notes as follows:

(a) rump, (b) socket, (c) top sirloin, (d) small end sirloin, (e) 1st cut ribs, (f) 2d cut ribs, (g) 3d cut ribs, (h) 1st cut chuck ribs, (i) 2d cut chuck ribs, (j) 3d cut chuck ribs, (k) 1st cut neck, (l) 2d cut neck, (m) 3d cut neck, (n) leg (hind), (o) 2d cut round, (p) 1st cut round, (q) flank, (r) top of sirloin, (s) navel, (t) plate, (u) brisket, (v) cross ribs, (w) shin (fore-leg), (x) shoulder clod. Here are twenty-four varieties of cuts in the same animal, the best of which is the rump, provided it is tender and well freed from the tough white fibrous connective tissues; the pure muscular fibre of beef is its most nutritious part, standing at the highest rank of the beef preparations. All the good things here said about beef are based on the pure red muscular fibre as obtained from the right kind of rump.

To recapitulate the goodness of beef.

a—Milk, an animal food, is the second natural food to the new-born babe, air being the first.

b—When the teeth appear, beef juice and broiled beef pulp are the best foods.

c—Beef-eating races have ever stood at the front, vegetable eaters taking the second place.

d—Beef-eating nations do not present leprosy, as vegetable-eating nations do.

e—Beef properly cooked, with water, can be lived on longer than any other solid food, animal or vegetable, and the normal health maintained.

f—Beef is quickly and easily digested; the stomach is a lean meat digesting organ.

g—Beef has cured grave chronic diseases, when vegetable food had brought them on.

h—Beef confers more force and staying powers than any vegetable food.

i—Beef is a Bible clean food, fed to Hebrew priests and Jews now.

j—Beef will make bad blood good sometimes in forty-eight hours and less.

Bones, hair, nails, teeth: The organic and inorganic elements are present in sufficient and assimilable quantities to make them perfect. Nothing in our civilization is more melancholy than the attempt to build up teeth on carbohydrates in excess. Hens fed at the sugar factories on refuse scraps, laid shell-less eggs with white yolks. The nails of a person who has been ill from typhoid fever will be found ridged and roughened three to six months after convalescence, because of the lack of proper nutrition in said fever; this condition of nails is found in other diseases; the teeth also will be found ridged, roughened and decayed in cases of malnutrition, but not when fed on beef. If the hair follicles are fed with a perfect food like beef and the head well ventilated, causal vegetations which have so much to do with baldness will not grow in the epithelia of the scalp of hair bulbs. Those who have seen the lions and tigers in the New York Zoo, who, though captive, look healthy and strong, and fed on raw beef, must acknowledge that it is a good food for bones, hair, nails and teeth.

Intestines: It does not make protruding abdomens, as vegetable feeding does, nor deposit whorls of semi-solid fat in the omenta; nor distend with gas as from fermenting vegetable food; nor develop fibrous tissues in the intestines and stomach by said gases. (*See* Fermentation.)

Force: Dynamis; from the Greek—to be able; it is kin to dynamo, and *might* have been dynamo, but the senior writer thinks that the termination is dynamis, that in one sense means "pull." It is the word the Saviour used when he turned on the multitude and said, "who touched me, for I perceive that virtue (dynamis) has gone out of me." It is a word that, including this most celebrated case of healing power, means all the abilities that are combined in the physical nature of man and of the spiritual nature, so far as it depends on alimentation. Physical and mental manhood being maintained on beef longer than any other solid food, it is par excellence a dynamis food; if, as we have said before, it takes power to do the work of physiological life when the body machine is in fine running order, it stands to reason that it takes more power to run said body in sickness and disease, because of increased friction; if it takes power to heal in sickness and disease, then as beef not only has run bodies in health longer than any other solid food, has done the same when bodies have been ill and sick, and while doing this has furnished power enough besides to cure and heal in a certain percentage of cases, then beef must be wonderful dynamis food. Pugilists have much force; beef is their main diet and they recover quickly from physical injuries.

Morphology: The most important of beef tissues is the muscular fibre; the white and yellow fibrous tissues, the fat, the arteries, veins, capillaries, tendons, ligaments and bones are all secondary. The blood is used, but not much. Wild beasts that prey on bovines eat everything, save the larger bones. *Muscular fibre* is of two kinds, cross striped and unstriped, or voluntary and involuntary, made up of fibres which in turn are made of fibrillæ; the fibrillæ of striped fibres are cylindrical or prismatic in man, 1-400 to 1-200 of an inch long and 1-1500 to 1-1200 in breadth; longitudinal striæ in straight or wavy paralleled directions, 1-12000 to 1-10000 inch apart characterize the voluntary fibrillæ. Unstriped fibre is made up of contractile spindle shaped cells in bundles held together by a cement; they are not especially noticeable here. The voluntary muscles are richly supplied with motor nerves whose final distribution is a mooted point with anatomists, but the motorial plates of Kuhne have received the support of some eminent authorities. The great points for us are that said muscles act mainly from nerve influence, whether it is inside or outside, and to repeat, that the muscle fibres separated as far as possible, properly cooked and fed, do sustain human life longer than any other solid food.

Heat: We quote from the valuable analyses of our Government in part: *Rump steak lean,* average of analyses, heat 780, fat 11.6. Out of 32 concrete analyses of beef under the head of *rump,* the lowest was heat, 480, and fat 2.9; the highest, heat 2145, fat 44.3. Reckoning heat as an element of goodness this puts beef better than it even is; fat 44.3, with 2145 heat units, if lived on long will produce fatty degeneration. "Heat is life and cold is death," is the old maxim of the botanics who gave hot water, cayenne pepper, lobelia, etc.; still people sometimes die of burns and sunstroke.

Chemistry: Myosin is the albuminous or protein compound in the contractile muscular tissues, liquid during life but coagulated in death (rigor mortis).

United States Government gives 774 analyses of beef. We quote a few:

Lean rump as purchased, average of 2 analyses: refuse 20.2, water 51.7, protein 15.7, fat 11.6, carbohydrates none, heat units 780, ash .8. *Rump very fat:* refuse 16.2, water 33.7, protein 12.3, fat 37.2, carbohydrates none, ash .6, heat units 1800.

Rump, all analyses: refuse 18.5, water 47.3, protein 14.4, fat 19, carbohydrates none, ash .8, heat units 1070. *Roast beef canned,* as purchased: refuse none, water 58.9, protein 25, fat 14.8, carbohydrates none, ash 1.3, heat units 1090. *Broiled chopped beef* is not on the list, and this is to be regretted. *Boiled beef:* water 51.8, protein 28.4, fat 22.5, ash 1.3, heat units 1405.

The great thing noticeable in these analyses is the almost complete absence of carbohydrates. We think if the white fascia aponeuroses and the white and yellow fibrous tissues were examined alone they would yield carbohydrates, as they are glue tissue. Beef practically analyzed by sole feeding shows that its chemical properties must include all that is needed to build up, sustain and maintain man's body tissues. Sole beef eaters do not get fat or obese, but there is fat enough to run the body without running into fatty ills which carry so many into their graves. The Government analyses lay great stress on heat units and draw comparisons with foods of the vegetable kingdom, deciding in favor of the latter, entirely overlooking the fact that no other solid food sustains normal life as long as beef preparations.

Climate: Beef is used most in temperate climes where it is of the best quality. In the frigid zones it is used as pemmican, *i.e.,* lean beef cut in strips, ground, mixed with fruit and compressed to smallest compass. (Nansen and his men lived for a time on walrus muscle and thrived on it.) There should be no difficulty in keeping frozen beef in the Arctic and Antarctic regions; they are natural refrigerators. In the warm climates, beef is a good food if properly selected, rightly cared for and cooked. Further, it is of interest in the last few years to see that the dictum that American troops did not need plenty of beef has been disproved, for it is found that beef is needed in the tropics for nourishment as well as in the cold countries; in Porto Rico the people living on the coast get beef and do not suffer from amœbic dysentery, while those inland who do not have beef suffer from said dysentery. Stanley, in his African travels with his men suffered from lack of beef and when they were able to get any kind of animal food were cured of various diseases. Cold storage is now a great success and makes sure good animal food wherever our navies sail. In the United States the best beef comes from the ranches in the West probably because the cattle are raised by the thousands and ten thousands by people who develop the cattle industry to its highest point. They must have good grazing and care.

Condition of feeders: Those who are well and hearty can eat almost any part of the cuts of beef, save the bones. On the other hand, those who are sick or ailing need the tenderest cuts and some require the separation of the red muscular fibre from the fibrous tissues. Beef properly prepared is the food for all after the teeth are cut or in connection with the breast milk, ere suckling ceases.

Manifold food: Generally and conventionally and is regarded as the *piece de resistance,* for when it is left out it is surely missed. It is beef that redeems mince pies from obloquy because of its nourishing powers and double cooking.

Natural food: Generally not much interfered with save in packing, salting and making extracts.

It is said that the beef of the Hawaiian Islands is very good. Possibly this may be a source of supply in time to come. We hope it will, as in our opinion beef eating would do away with leprosy. Barbecues are another beef-eating custom. A whole ox is dressed and spitted and roasted over a fire of coals made in a pit or ditch. They are usually for political purposes. The junior writer has attended two "beefsteak dinners," at which an inordinate amount of beef has been eaten, with thin slices of bread and olives and celery as relishes; beer and ale freely drank; the disagreeable next morning effects of a conventional banquet were not experienced.

About twenty-five years ago, Dr. R. J. Nunn, of Savannah, Ga., proposed to a firm of chemists to grind beef bones into powder and use as food in cases of deficient bone growth. This was then approved by the senior writer.

Aesthetics and fashions: We do not think that raw beef has æsthetic eminence; we hear little of the beauty of a broiled beefsteak; still no great fashionable dinner is æsthetically perfect in the estimate of the bon-ton caterer without beef. For the multitude of things pleasant to the eye and palate that are crowded into the stomach at an æsthetic banquet are enough to kill people; but with all possible latitude to expression, beef cannot be said to be an æsthetic, fashionably expressed. To be sure, to the hungry wearied by work out-of-doors there is nothing more beautiful in the line of food than a well-cooked beefsteak; a delightful aroma and a musical sizzling are the best kind of nasal palatal and appetizal harmony to him. This is true of other articles of food, for as has been said "hunger is the best sauce for a meal."

Religion: No animal food figures more in the Bible than beef as cattle, 4004 B.C. and also as clean. In modern times, the Latin and Greek churches prohibit beef in Lent; besides the Latins prohibit beef on Friday. The Buddhists are not allowed to kill any animal, bovine included. This seems to be a revival of Egyptian religion. It cannot be denied that the Israelites in the height of their prosperity revelled, religiously speaking, on beef.

Builder of tissues: Yes, for how could healthy man otherwise subsist on beef as sole solid food for years? As lean beef has no carbohydrates, and little or no fat, fatty acids are not in abundance in said beef eaters, but there is all the normal fat needed and its proper development. Taking advantage of the metabolism (Greek) or transformation (Latin) that is going on in the human system, by which, save the teeth and bones, the whole human body is renewed every seven months, lean beef will lay down healthy tissues and organs.

Effect on skin: Good for reasons as stated in previous paragraphs.

Diseased conditions: Good beef has none; some people are nauseated by beef, but not nearly so soon as by almost any other solid food. Beef long exclusively used sometimes produces meat dyspepsia with sulphuretted and phosphoretted hydrogen gases; but it is very, very rare, and almost every other kind of flesh eaten exclusively will produce symptoms long before beef. Physicians have said that beef causes Bright's disease. One who said this was asked that if he ever knew a case of his own observation. He said "No." Reply was made to him that there was evidence of cases of Bright's disease (diagnosis based on oil in the blood specimen, coming from the fat underneath the skin, or in the white blood corpuscles and albumin, fatty epithelia and casts of kidney tubes in the urine) to have been cured by medication, hygiene and a diet for some months of beef almost exclusively used and properly cooked, said cures being verified by the absence of abnormal stigmata in blood and urine and further in one instance at least, of the acceptance by an insurance company which had previously rejected the case because of the evidence of Bright's disease.

Kit Carson, the famous Rocky Mountain guide and scout and the cowboys of the Pampas of South America, lived and thrived indefinitely on beef and water. If the words of our friends the vegetarians were true, then Kit Carson and said cowboys ought to have been terribly diseased from the beef; on the contrary, it has been said by eye-witnesses that they were such examples of endurance that it seemed that no exertion could kill them.

Fermentation: Being without carbohydrates, lean beef does not ferment with the common saccharine alcohol and vinegar yeast, but gelatine or glue tissues in beef do ferment, as they are practically carbohydrates. These tissues abound in tough beef, hence will cause fermentation like that of sugar of the common ethylic alcohol and vinegar kind and make much physiological trouble. Beef muscle when it does ferment, has a different alcohol and vinegar; and if such fermentation was common like that of glue tissues or sugar, men could not live on it for years. (*See* chapter on Fermentation.)

Badness: Some regard beef as very bad. Galen affirms that "Biefe maketh gross blood and endangereth melancholy, especially if it is much eaten by those of melancholy complexion in whom it breeds cankers, scabies, leprie, fevers, quarriane, and such like." Isaac Judeus agrees to this, and Seo Sal reckons beef among the kinds of foods unwholesome for the sick; but Cogan says that these authors err in making beef of all countries alike. Had they eaten English beef he thinks they would have judged otherwise or perhaps they meant old or very salt beef. Cogan thinks that beef is unwholesome for the sick and this is the conventional opinion to-day, that it is too hearty for the very sick; yet it is fed to the actually sick in typhoid and other fevers, in the early stages of convalescence and with ultimate and quick recovery, not mentioning other diseases. At a New York sanatorium, where patients were fed on broiled beef from which the white fibrous tissue was separated, a large dog was fed on said white fibrous tissue refuse which produced dysenteric discharges. Years ago the French Academy of Medicine fed dogs on gelatine and they died in forty days; now gelatine is glue which is made mainly from the white fibrous tissues of beef; as soups dissolve out the white fibrous tissue gelatine, they are not so nutritious as thought so far as the beef part is concerned.

Beef may be bad from bad pasturage, keeping, sickness, and especially tapeworm. Cow beef is the poorest unless specially well fed.

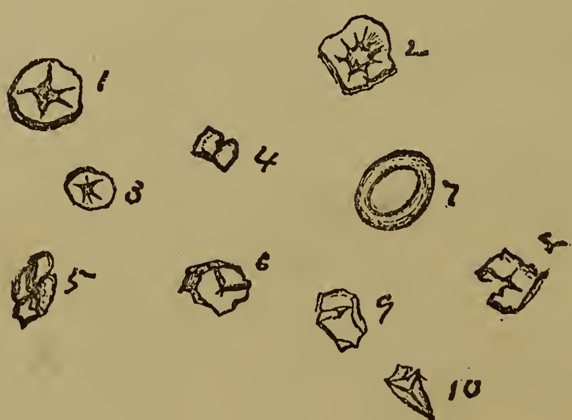
Producing tuberculosis: The milk of kine is charged with this. Allow it: Against this is set 100 cases of tuberculosis reported to the Berlin 1890 International Medical Congress by the writers, in which the physical signs were strongly manifest, which were treated by broiled beef mainly and yet 40 per cent. were cured, and most of them of over ten years' standing; again, a few years ago milk furnished a New York Boys' Asylum was found to be tuberculous, but in said asylum there was not a case of tuberculosis; there should have been if tubercular milk causes tuberculosis. We do not recommend diseased milk or any other diseased food.

Diarrhoea: In the summer season we have found beef to renew a diarrhœa in an old case of chronic diarrhœa cured; but as this stopped, when mildly salted beef or ham was employed, we are inclined to think that the beef was not properly kept; beef tea largely used is one of the best remedies for constipation; it will produce diarrhœa, but without the faintness and weakness of ordinary diarrhœa. Sometimes the beef smells "cowey," as milk does sometimes. This is probably due to fungoid vegetation; but it is unpleasant chiefly to the sense of smell; properly cooked it would not harm. But the beef referred to in the above case was undergoing fatty degeneration. No else to be had.

Parasites: Tænia solium or tapeworm is the most common and well-known parasite in beef; is many yards long and has several segments; one end of said worm is knot like, is called the head, and is provided with four suckers (misnamed), as they have no opening; the worm is fed by osmosis. Besides there are hooks, very small and minute, which allow the worm's attachment to the intestines; but this source of fear in patients is unnecessary, as they are often found curled up without any attachment to the intestines. The species are very numerous; most common in birds, next in mammals, poultry, sheep, rabbit, dog, hog, bovines, then in fish and least in reptiles. The ox specimen is cysticercus, cystic form of media cannellata; in the cat, echinococcus; in the dog and wolf, serrata; in the hog, solium. The eggs are in the proximal end (and are very abundant, probably millions); are very beautiful and are laid enveloped in a capsule and adhere to the place where they are deposited until swallowed by the temporary or intermediate host (ox) by being eaten in grass, hay or other food. They are developed in the ox into hooked embryos, which bore through the alimentary canal into the muscles, specially, or other tissues, eye, liver, etc., or into the arteries, by which they enter into the brain. The embryo then surrounds itself with a cyst or bladder of fluid and becomes a hydatid or bladder worm, once thought to be an independent worm, but now proved to be the larva of tænia. When in the muscles, they wait until their resting place is turned into beef and eaten by man and unless killed by cooking, may develop into tapeworm. Tapeworm larvæ are found in the brain, liver and other organs of man, hence if cannibalism was the custom, no doubt man would develop more tapeworms than now; but as it is, man must get them through another animal, as the hog, sheep, poultry, ox, etc., so that practically the development of tænia requires two different animals. It is possible, also, that fowls are more infested with tænia than any other animal. Beef and pork having tapeworm are said to be "measley." There is no desire to minimize the dangers of having tænia from beef; it must bear its share of responsibility; hence we insist on not eating raw, rare, nor underdone beef, but having it fairly well done, so as to coagulate the albumin of the larval hydatids. Every tænia subject voids millions upon millions of eggs, so for one tapeworm developed in man, there must be billions of eggs lost. In town or city life the eggs of tapeworms from humans go into the sewers, for the most part out of the reach of man, unless the sewerage pollutes a source of water supply. Even then the fish scavengers, the fauna of all hydrant waters, might destroy the tænia eggs; though possibly they may thus get into the fish as intermediate hosts and the fish communicate back to man.

Intemperance: This is so if gluttony and gormandizing with beef is intemperance; but the gluttons and gormandizers of beef are, from the evidence foregoing, healthy and must suffer from overloading and with overuse as with air and water—two other vitally indispensable foods. People about to perish from want of food have, when beef was given them, eaten to intemperance, but with little or no trouble. Other instances might be given. The sick have eaten of broiled chopped beef from one to three pounds daily with no ill effects; therefore intemperance with beef does not cause the trouble that intemperance with other foods and liquors produce. Beef is also a remedy against alcoholic intemperance.

Beef and uric acid: Dr. Haig says that beef contains uric acid that gets into the blood and is the cause of most of mankind's diseases and hence that beef is not to be eaten. We differ. If our colleges and universities made microscopy a requisition for admission, such words against beef would not be written, since Clinical Morphologies show that uric acid is *very rarely* found in the blood; but other crystalline or granular bodies are found very commonly in diseases as pointed out years ago. Oxalate of lime, cystine, triple phosphates, carbonate of lime, cholesterine, stelline, stellurine, uric acid, etc., were, when present in the blood not in solution, not only signs of the prerheumatic state, but of the rheumatic state; but Haig accuses uric acid in both as causal of diseases alone. Now, if this is so, how is the following case to be explained. Dr. ——, now dead, once said he had sciatica and suffered much; he was told that the blood would show the cause. It did.



The above is a cut of the cystin crystals found in his blood and the diagnosis was cystinic rheumatism. His urine showed no uric acid, but it would have shown it by acidulating with nitric acid and letting it stand over night. (This was one of the teachings of the Harvard Medical Laboratory, 1853-54.) The clinical proofs were that in a day or two the cystine was gone from the blood and with it the sciatica; the means used were two quarts of hot water daily, lemon juice galore and broiled beefsteak. If our friend's argument was true, his blood should have been loaded with uric acid, to say nothing of the urine, because he ate beef. In our medical experience, which is individually from twenty to fifty years, we have never known beef to produce abnormal uric acid in the blood or urine. We have given it liberally in our practice and with constant clinical study of the blood and urine; if beef is poisoned with uric acid surely we should have met with it, and in this experience we include the case of the senior writer, which has been studied daily for seven years.

Haig says that uric acid in the blood is sometimes in a colloid condition and not crystalline; starch not cooked is a colloid, but it has a form, shape and color distinguishable by the eye; the writers have never seen uric acid as colloid and to repeat very rarely as crystalloid, indeed the presence of other crystals hereinbefore named is many times more frequent than of uric acid. (The most common colloid of the human body is seen in the feces of chronic diarrhœa.)

Just here we may ask how are salts deposited as crystals or granular form in the blood? Fifty-three years ago the Harvard Medical Laboratory set the senior writer to work testing for soda and potash in any and everything he could find, the best test being in the crystallography; solution would be made and a drop or two placed on a slide, set away and covered for the night to evaporate slowly. Next morning crystals would be found and their forms would tell the story of salts of potassium or sodium. At the time it seemed to be a small business to the student, but since trying to understand the physics as well as the physic of clinical medicine, there has been impressed that this law applies to the human body, to wit, *salts held in solution are thrown down in solids when their menstrua are diminished.* If the process is slow, crystals are formed; if it is quick, then granules or amorphous deposits appear; there is no reason why this law does not apply to the human body salts. Apply it to uric acid and the other crystalline and granular salts found in the blood, *i.e.,* if the blood has water enough, uric acid and the rest will be held in solution and will be excreted by the emunctories normally; if there is no water, that is, not enough to keep them in solution, then they will be deposited. All our patients are made to drink water enough to have the urine 1020 to 1015 specific gravity, as this is characteristic of a healthy babe's urine, nursing a healthy mother. The man with the cystinic rheumatism did this, though the lemon juice helped. (Parenthetically, lemon juice in some forms of rheumatism excites the disease and the diagnosis can only be accurately made by microscopical examination of the blood.) We think that if Dr. Haig had made his patients drink water enough, he would have found that the troubles he attributes to uric acid (?) in blood and urine would disappear.

Beef extracts: Many of the commercial preparations suffer from an excess of glue tissues; in 1889, the attention of the senior writer while in London was called to Bovril; we have found it to stand morphological and clinical tests and can most unqualifiedly recommend to the profession the use of the Bovril preparations of Bovril, Ld., of Montreal, Canada.

Morphology of abnormal beef fibre: The present tremendous interest in the condition of packing houses suggests that physicians can microscopically study local beef deliveries; normal beef fibres present a red color, little or no free oil, cross marks perfect, no fat and no buttery or amœboid oil inside nor outside.

Data culled from 50 *examinations:*

(1) 1905, Feb. 11. From Jamaica Plain, Mass. Claim; good, sound healthy beef. Color pale, white as a sheet; cross marks half obliterated; finely granulated fat inside of fibres, but not excessive; fat looking like butter abundant outside.

(2) 1905, April 19, New York City. Pale; cross marks good; considerable fat in oval forms; abundant oil globules; substance of fibres finely granular.

(3) Same date and place. Chopped beef. Pale; oily like butter; substance finely granular with fat; longitudinal markings—striæ, plain. Not so good as (2).

(4) Veal. Same. Very pale and bleached; no cross marks; striæ faint; fibres finely granular with minute masses of fat.

(5) Same. Pork. Very pale; no cross marks; striæ present; oil.

(6) Mutton. Same. Pale transparent; not much fat nor oil globules.

Note. 5 and 6 are introduced here as they were examined with 2 and 3. Six was a surprise, as many oil globules are generally found.

(8) 1905, April 27. Boston. Color, slight red; no cross marks present; oil in interspaces between fibres; fibres somewhat granular inside; much better than the average Boston beef, but by no means a normal specimen.

(9) 1905, April 25. Philadelphia, Pa. Claim, first-class beef killed in Philadelphia. Color pale; plenty of oil like butter; cross marks faint; few granules of fat inside the fibres. April 27, 1905, second examination of the same specimen. Some oil; some granular fat; cross marks fair.

This was not kept on ice. It came from cold storage. But it did not meet the standard as expected.

(10) April 26, 1905. The Bronx. Hamburger. Color pale; cross marks faint, as a rule; buttery oil plenty; free oil globules outside of fibres, that were finely granular inside.

(12) May 5, 1905. Daphne, Ala. Color more red than the average; cross marks large and plain; little free oil; some granules of fat in fibres. Came in fine condition through the mail. Good. This was a pleasant surprise.

(13) May, 1905. Bennington, Vt. Color pale; cross marks plain; some free oil, not excessive; no granular fat in fibres.

(15) May 5, 1905. Brooklyn. Color pale; buttery oil, but not abundant; striæ and cross marks.

(16) Same as (15), another sample. Color, paler red; cross marks present; oil globules abundant; granular fat inside fibres.

(17) May 6, 1905. From Harwichport, Mass. Color pale as white paper; striæ marked; some buttery fat but not as much as usual; granular internal fat slight.

(18) May 10, 1905. Country beef from Middlefield, Conn. Color very pale; no cross marks; infinitesimal granules in fibres; not much free oil.

(19) May 12, 1905. Somerville, N. J. Color pale; striæ marked; some cross fibres; some buttery oils; fine granular matter in fibres.

(21) May 18, 1905. New York. Rabbi or kosher beef. Color better; cross marks distinct; some striæ; slight oil; no granular fat inside fibres. Should say this was much better than the average beef.

(22) May 18, 1905. Brooklyn. Color paler than it ought to be; cross marks all very fine; striæ marked; generally an absence of buttery fat; no granules. Good beef.

(23) May 18, 1905. Another specimen. Storage beef.

Color distinct but not fully red; little fat of both kinds; cross fibres marked.

(24) May 18, 1905. Tenderloin beef cooked rare and taken from the dining table. Color good; all fibres cross marked; little or no fat nor oil. This is the nearest to the standard.

(26) May 27, 1905. Kosher beef, fresh killed in Brooklyn. Good color with one inch objective, but was thought not quite up to the standard; cross marks distinct; some striæ; not much oil; fine granular fat in fibres.

(27) June 6, 1905. New York. With one inch objective; color reddish; little oil; cross marks distinct; with one-quarter inch objective; some oil and buttery fat; granules abundant; cross marks clear.

(30) June 8, 1905. N. Y. department store. Color palish; cross marked; striæ; little oil; some granular fat. Triple phosphate crystal, such as is found in urine; mycelial filament of yeast very white and pale, probably foreign.

(34) June 17, 1905. Porterhouse steak. New York. Muscular fibres, some pale and some reddish; cross marks present; one-half of the field under the microscope was filled with oil in globes, globules, granules; also ameboid and buttery.

(35) June 17, 1905. "Best beef in Rutherford, N. J." Color pale; some cross marks; striæ; not much free oil; some granular fat inside fibres.

(37) June 22, 1905. By the politeness of Dr. Darlington, President New York City Board of Health. Chicago stock killed here. Specimen only a short time in the iced storehouse. Color fair; cross marks abundant; some striæ; not much oil on fibres, though some of them were amœboid; granular fat inside fibres none. This firm deserves help. (J. Stern & Co.)

(38) June 24, 1905. Examined after keeping away

from the cold storage. Color pale; striæ somewhat in evidence; cross marks less numerous; globar oil large and small, abundant; granular fat everywhere present inside fibres.

Note.—This goes to show that beef decomposes by fatty degeneration. The smell of this specimen was not bad, while the odor of some control beef kept in the open for two days by the side of (38) was almost unbearable.

(39) Beef from Dr. Jordan, Boston Board of Health, kindly sent in response to a request for a sample to photograph as typical of good sound, wholesome beef. Examined June 27, 1905, at once upon receipt. Color pale; few cross marks; some striæ present; some granular fat in the fibres; some oil globules, not many; ameboid forms plenty on the cover glass. Later examination: Color pale; striæ more abundant; granular fat everywhere inside the fibres; oil globules abundant but far less than in the average sample. Thanks rendered to these officials for their aid.

(40) July 4, 1905. Plymouth, Mass. Hot weather. Color good; cross marks generally present; no striæ; some free oil globules; none amœbic; none granular; sample stank; a good specimen considering the environment.

(41) July 9, 1905. Alexandria, Minn. Came in good order, though slightly tainted. Color to the naked eye grayish red and slightly glazed. Color under the microscope palish red; cross marks good; striæ none; no granular fat inside the fibres; hardly any oil globules. Considering the distance sent and the season of the year, this is a remarkable showing. Again it proves that a deep scarlet red color of the meat to the naked eye is not always a sign of the tissues being free from fatty degeneration. This the writers have found out many times to his sorrow in his own kitchen and on his own table.

(42) July 12, 1905. U. S. Army Purveyor beef. Claim to be perfect in quality. Color pale; oil in globules very abundant; oil in granules inside the fibres very abundant; cross marks mostly absent; striæ abundant.

(43) July 7, 1905. Another sample like (42). Color to the naked eye grayish red; under the microscope the best red the observer has seen for years; cross marks universal; striæ and oil globules few; no granular fat; smell good. Observation made at ten A.M. At one P.M. the same day, the sample having been kept away from storage, very fine fat granules were found pervading the fibres; the other appearances being held.

(45) July 22, 1905. Alexandria, Minn., grass fed and only four days in the cold storage. Color fair; cross marks few; striæ present; oil in globules; not much fat inside fibres; many crystals of triple phosphates; fibres fused together, some of them evidently doctored; not much smell of decomposition; not so good as (41).

(46) July 29, 1905. Another specimen from Minnesota. Color to the eye grayish red; under microscope fair; cross marks plain; some striæ; hardly any oil or fat in globules or granules. A good specimen.

(47) August 3, 1905. Beef from Faneuil Hall Market, Boston. Color palish red; cross marks few; striæ much abundant; oil in globules and buttery shapes; all fibres finely granular with minute granules of fat.

(49) In this number are lumped examinations made for several years past, all of which may be summed up as undergoing fatty degeneration.

(50) Date forgotten. Brockton, Mass., a patient said that his butcher furnished good, sound, wholesome, healthy beef. This he was assured of by the butcher himself, who was to be trusted, as he was a man of his word.

Knowing the informant to be entirely trustworthy, the senior writer gladly availed himself of this opportunity to obtain a normal specimen for study and use; he arranged to have a four-pound roast sent from the said butcher. When it came it looked all right to the naked eye, but the microscope showed it to be of the color of butter; to have no cross marks; no striæ even; nothing but a fatty mass that had every appearance of common butter, so completely had the process of fatty degeneration gone on. When the writer and the butcher met, he would not yield an atom from his position and he died holding fast to the same contention, that it was good, sound, wholesome beef.

Cooking of Beef

Poor cooking makes beef bad. If it is raw, the beef is indigestible and also confers tapeworm; while cooking coagulates their albumin and renders them harmless. No doubt if we had been brought up to eat raw beef we could digest it and run the risk of the worms. Again, if the beef is overcooked, it is hard, leathery and the nutritive qualities are destroyed, making a double loss. The golden medium is in cooking just enough. It should be remembered that beef will cook more after it is served on hot plates (like baked loaves of bread after being taken from the fire), especially if chopped.

Boiling, because it removes the soluble mineral portions (and beef can be boiled until all its goodness is gone) is the poorest method if the liquor is thrown away.

Roasting is much better, especially if done before an open fire.

Baking in a closed pan * with water is a form of steaming which is excellent.

* Papin's digestor 1660 plan.

Broiling on a grill with a wood charcoal fire is the best, because the beef is not overdone nor charred; there is a great advantage in the ventilation of broiling.

Frying in a pan immersed in fat is bad, because of the want of ventilation and the temperature, being raised to that of boiling fat (400 deg. Fahr.), removes the water, making the beef tough and hard to digest and drying up the nutritive juices.

Frying in a pan whose surface is covered with fat, so that the beef will not stick, and turning often, is a less objectionable form of frying, as the beef is not immersed in boiling fat.*

Stewing in water and retaining the liquid, is a good method, especially in England, where the soft coal does not give a very good fire for broiling.

First-class restaurants on land and sea use charcoal, and there is no reason why private families should not do likewise for broiling, as the market affords a good broiler for this purpose and a big bag of charcoal costs only ten cents; or make a charcoal basket of old mosquito wire netting. For broilers use a wire toaster or double perforated sheet iron plate broiler smeared with fat, so that the steak will not adhere. Another method is to put the steak on a bed of live anthracite coals; the steak is soon charred outside, thus retaining the juices. When beef is very tough, twice cooking is excellent. Indeed, steak half cooked will keep in hot weather and when wanted the process may be completed with fine results. This is also done with fish admirably.

Porterhouse Steak

The sirloin and tenderloin combined. The tenderloin is more fat and less hearty, has less staying powers than the

*A good fry is obtained when the pan is sprinkled with salt. Heat till the salt is slightly brown, then put in the steak, chopped or not, and let it cook in its own juices. Be careful not to have the fire too hot.

sirloin (which in turn is inferior to the rump from large bovines four to six years old, stall fed, which, to repeat, is the ideal steak when freed from its white muscular fibre.) Porterhouse steak is a term arising according to the Standard Dictionary from a New York eating house, but for years the senior writer has believed the name was derived from the owner and landlord of Porter's tavern (still extant in North Cambridge, Mass., which was always in its day famous for its steaks and a great place of resort for roadsters). The secret of a porterhouse steak is to have a good one and cook it over a wood charcoal fire; this temperature does not burn, nor char, but at the same time cooks tenderly and thoroughly. This is also done very well at present by the modern gas stove, broiling both sides of the steak at once.

Broiled Chopped Beef

This is the muscle pulp of the width of the top of the round of well conditioned bovines, killed at the age of four to six years, free as far as possible from the glue tissue, fat, cartilage, bone, etc. In preparing same, the hands should touch the muscle pulp as little as possible, as human animal heat changes its character; it can be separated slowly by chopping in a common wood-chopping tray, and detaching the pulp by scraping by those who have the strength and time; this is the best method. The modern machines are at fault, in that they cut up the muscle pulp and white fibrous tissues together with but little separation. Steaks cut through the center of the top of the round are the richest and best for this purpose. Broil over a charcoal or anthracite coal fire incandescent, or with gas, not too hot or too cool. It should be turned as often as it blazes, so as to cook not rare but fairly well done; the outside to be a dark brown color and the inside reddish, but not raw. Serve on hot water plate; season with pepper, salt, butter, as desired.

Hamburg Steak

This is made of chopped beef with seasoning and cooked by frying. It includes all the glue tissue and is generally taken from the poorest and remnants of any beef cut. It is far inferior to broiled chopped beef. There is a Boston firm who make it from beef on bones of fine cattle and is worthy of use; likewise so when the butcher cuts it from good beef.

Roast Beef

This, of course, includes fat, fascia and white fibrous tissues. It comes next to the broiled chopped beef. The roasting exhausts the nourishment somewhat; this must be from the escape of the soluble nutritious elements.

The common method of roasting is in a stove oven and is really a baking process in some steam, as water is usually used in the baking pan and comes from the roast itself. But the closed baking pans are practically a kind of steaming and are much better for roast beef than the open, because the roast is not dried, charred nor burned and its best juices evaporated.

Corned Beef

Corned is derived from the Latin cornu (horn), referring to horned cattle, and means beef preserved in pickle of strong brine of common salt, with sometimes saltpeter added. There are various degrees. When for ship use or export, it is excessively salted, so that sailors call it "salt junk," as it is almost stony hard. Liebig asserts that corned beef loses about seventeen per cent. of its soluble nutrition by the osmosis of salting. This present age varies the amount of salt used. Salt horse or junk is not so nourishing and palatable as pickled beef when only salt enough is used to keep it. It is wise therefore not to salt beef much beyond the point of preservation from decay. Recent years have shown an improvement in corning beef; to four pounds of beef add one-third of a cup of salt; put in cold water and gradually heat to slow boiling until done; the results are a retention of more than the ordinary nourishment of corned beef and a delicate flavor, tenderness and softness good for the digestive organs. Care should be taken that the process of boiling should be not much more than simmering; another advantage is that better cuts may be used than what the butcher corns; poor beef is not made any better by corning.

Chemistry: United States Government reports: *Rump* corned beef, refuse 6, water 54.5, protein 14.4, fat .22, ash 3.1, heat units 1195. *Corned rump canned,* refuse nothing, water 56.3, protein 23.5, fat 18.7, ash 1.5, heat units 1225. (*Raw rump,* refuse 30.2, water 43.7, protein 14, fat 11.03, ash 8, heat units 735.) From the chemical standpoint, raw rump compared with corned beef, canned and not, has 24.2 per cent. most refuse, the least water by about 11 and 13 per cent., protein about the same as corned, and 9.5 less than the canned corned; heat units a little less than one-half; physiologically or chemically the most force according to our experience is in the broiled uncorned rump. A point in favor of mildly corned beef is that it does not ferment in the alimentary canal, like the poor beef in a community where diarrhœal affections are rife. Sometimes canned beef is "cowey" in smell, but this beef was wrong to begin with. "*Horse beef*" sold as such in Paris in 1862 and tested by the senior writer, is sometimes substituted. The testimony of a lady to the horse meat diet of the 1900 Pekin besieged diplomatic corps was that it was nutritious, despite the smell; necessity made them eat what they could get; but these things are written for those who live on account of, not in spite of their environments. If we could eat the brine and the corned beef both, there would be little loss; but this brine is of such a great specific gravity that it interferes with the normal osmosis of absorption.

Tripe

Chemistry: U. S. Government analysis: Maximum water 91.1, minimum water 72, protein 13.5, fat 1.8, carbohydrates .5, ash .3, heat units 325. Principally fibrin, albumin and water (Yoeman). These are the only analyses we find. Physically, tripe has shown merits as food, which was retained when no other food could be. Life can be sustained on tripe for ninety days. It is easily digested. Tripe comes from the "clean ox"; the butcher prepares it by soaking in water and scraping; it is then boiled, or should be, to softness; the cook should test for tenderness and boil longer if need be. It can be eaten broiled, stewed or otherwise, at least after the preliminary boiling. If cooked after the old Tremont House (Boston) method it is a most appetizing and digestible dish. Steaming is the best method.

Morphology: In man the stomach is made up of longitudinal, circular and oblique muscular fibres of the involuntary kind, besides serous, mucous and areolar coats of the blood vessels and gastric glands. The bulk is a smooth muscular fibre and normally the fibrous tissue is not in large proportions; but it may become thickened by carbohydrates and gluey foods in excess and if these are long continued, fibroids of the stomach are excited, which are sometimes called cancer and may indeed degenerate into cancer itself. Now in the bovine stomach which is used for tripe, the bulk is mainly muscular tissue, which sustains the wisdom of the suggestion that tripe is good food for those who like it.

Dried Beef

Chemistry: United States Government reports—*Mexican sundry,* average water 19.1, protein 47, fat 21.6, ash 12, heat units 1785. *Dried and salted Uruguay,* water 30.7, protein 46, fat 5.6, ash 16.9, heat units 1110.

Dried, salted and smoked, average water 50.8, protein 31.8, fat 6.8, carbohydrates 6, ash 10, heat units 890. This preparation is for hunters, explorers and travellers or where fresh meat is hard to get.

Taking the chemist's view, the large amounts of protein, ash and heat units make this a first-class food. But the creosote, pyroligneous acid and salt (the preservative chemicals) are physiological banes to digestion and assimilation.

Such preparations are too tough and too chemically cooked, but can be used as a relish.

Ox-Tail

For well people, ox-tail soup is good, when cooked so as to separate the muscles from the bones and there is no separation of broth from the meat. It would answer for chronic disease in some cases. Such soups are a great improvement on common soups, because the broth is kept with the meat; usually they are very palatable.

Beef Tongue

This wonderful organ makes a delicious side dish at meals. United States Government analysis: First, refuse 15.1, water 53.9, protein 14.8, fat 15.3, ash 9, heat units 920; second, ground and canned, water 49.9, protein 21, fat 25.1, ash .4, heat units 1450; third, canned and whole, water 68.9, protein 16.2, fat 2.6, ash .4, heat units 420.

According to this, No. 2 shows 21 protein and is the best, but it must be tested by the functions of digestion and assimilation, which according to our best knowledge it responds well to.

Veal

It was known and mentioned among the Romans. Galen says that veal is easily digested and nourishing. Cogan speaks of it as being used in England before 1589; says it is better roasted than boiled. (Sometimes vegetable products are better when young and tender, as asparagus, lettuce, string beans, and some are better when old and ripe like almost all fruits.) "Bob veal" removed from the cow after slaughter is not good, so that the almost general consensus puts veal as a bad or at least inferior food. The bleeding and starving of calves to make their meat white is everywhere condemned, save by those who make money by it. Veal is less digestible and nourishing than beef.

Chemistry: The United States Government reports some 155 analyses of different cuts of veal—*Rump* as purchased, refuse 30.2, water 43.7, protein 14, fat 11.3, ash .8, heat units 735. *Beef rump* averages: Refuse 18.5, water 47, protein 14.4, fat 19, ash .8, heat units 1070. These comparisons make veal refuse 11.7 more, water 3.3 less, protein .4 less, fat 7.7 less, ash the same, heat units 335 less, so that on this showing veal is less nutritious than beef with more refuse and less everything else, save ash, which is the same. The best veal is that cooked in an oven over an oil stove, taking an hour. This is tender, juicy, palatable and digestible.

Calves' feet and head: These are a good occasional dish and appetizing.

Veal stands very high as a child of beef and of the same clean blood. Is subject to the same diseases, but has the same excellent qualities in a less degree. Where it is possible to obtain pasturage and herders, it would seem more profitable to raise veal to beef. Ordinary farmers' calves are not profitable, as they consume the milk, so dairymen ruthlessly deprive milch kine of their calves. The evidence of cow memory and affection is so great that it is a question whether there is not a loss in separating mother and offspring, as it is conventionally done.

MUTTON AND LAMB

From 4004 B.C. to now they have been eaten. Cogan (16th century) says that "in England mutton is used more than any other meat both in sickness and in health." They figure among the Roman writers and are mentioned in the Bible from Genesis to Revelation as clean and next to beef. Cogan says: "Mutton is so light and wholesome in digestion that it is seldom seen that a man hath taken harm by eating it raw." Most physicians have commended mutton, save Galen, but Cogan disproves Galen by English evidence. The United States Government puts it next to beef.

Mental kingdom food, as proved by the long time that healthy human beings have lived on it solely.

Good when clean, properly raised, and cooked. Sheep thrive best in mountainous regions where the air and water are good. Another good food quality indirectly is the wool of the sheep, whence mankind is clothed and protected. Count Rumford and modern imitators have argued that wool next to the skin was the best. It is easy to see that woolless clothing would not protect the average multitude as woollen goods do, rendering less heat needed to run the body, warding off colds and other diseases that come from chilling the body surface and thereby making serious inroads on the constitutional and food forces of the body systemic. The wool oil or lanolin is a most excellent excipient for ointments. Spiritually, sheep and lamb are good food for meekness, submission, innocence, mildness and patience, which save force (otherwise lost by their opposites), and can be used to digest and assimilate the food. (A fit of passion will arrest digestion, and this is one reason why the heart sometimes stops in an outburst of anger.)

Bad if abused and improperly cooked or served. These can be avoided, but mutton and lamb do not furnish power enough always to keep out fatty ills stigmata after they have been removed by beef. The badness of mutton is not very bad, else the New York Deaf and Dumb Institute could not have kept its four hundred inmates on beef and mutton as animal foods for nine years with one death only. The tendency of mutton not to subdue fatty ills should not be forgotten by those over fifty years of age, who naturally come into the cycle of advanced age, retarded and impeded circulations and hence a predisposition to apoplexy, paralysis, senile gangrene, weak heart, Bright's disease, etc.

Condition of feeders: To all under fifty years of age in health and sickness, save the fatty ills, mutton and lamb are adapted by their tenderness, cleanness and digestibility. It is also cheaper and thus is not barred by poverty. But the cattle of the United States constitute greater articles of value than sheep, as the latter are worth $170,109,743 against $1,117,165,160 for beef; so we must conclude that Americans do not eat more mutton and lamb than "beef," notwithstanding their cheapness.

Morphology: The texture of mutton and lamb is tenderer than that of beef, but the fat tissues are more in evidence. There is also a good deal of white fibrous connective tissues, especially on chops, which are hard to digest and make gelatine. The muscular tissue of sheep is unusually tender, else man could not eat it raw and digest it.

Chemistry: United States Government analyses are quoted as follows: *Lamb hind quarter* as purchased: refuse 15.7, water 51.3, protein 16., fat 16.1, ash .9, heat units 975. *Lamb shoulder:* refuse 20.8, water 41.3, protein 14., fat 23.6, ash .8, heat units 1130. *Mutton* *hind leg* as purchased: refuse 16.8, water 56.1, protein 15.9, fat 10.3, ash .9, heat units 730. *Mutton hind quarter* without tallow and kidney: average 9 analyses —refuse 16.7, water 45.4, protein 13.5, fat 23.5, ash .7, heat units 1245. *Mutton canned and corned,* as purchased: water 45.8, protein 20.1, fat 2.8, ash 1.2, heat units 490. *Heart* as purchased: average water 69.5, protein 17, fat 12.6, ash .9, heat units 845. No carbohydrates, save from the liver, which is a sugar-making organ. Fat percentages of mutton and lamb range from 95.8 per cent. kidney, to 2.6 liver. Fat percentages of beef ranges from tallow 88.9, to 1.1 lean leg (marrow 92.8). Average of beef fat, highest 46.8, lowest 3.3. Average of mutton and lamb, highest 73.9, lowest 8. Or mutton and lamb, according to these data, are more than twice as fat as beef in the lowest percentage. While as to the highest percentage beef is somewhat less than $\frac{2}{3}$ of mutton. This explains, we think, why mutton does not work so well as beef in fatty ills and organic diseases; but without regard to these data the fact that man can live solely on mutton and lamb in health next to beef is a good proof that the chemical elements are enough to sustain life regardless of the laboratory.

Physiology: They are physiologically adapted to sustain the normal functions of human eaters, save as in the instance of fatty, fibroid and organic disease; the lean muscles are digested in the stomach, while the fat and glue tissues are digested in the intestines.

Disease: Fat in excess produces first obesity; not a disease, but predisposing to fatty degeneration diseases. So mutton with its excess of fat may, and no doubt does, sometimes produce fatty ills; it does not often produce diarrhœas and does not have even so much difficulty with its glue tissues as beef, because they generally are more tender and digestible. New England mutton or lamb is more or less tougher than that of Kentucky. Great Britain mutton is tender, sweet and good. Mutton cooks much better on old England soft coal than beef. Mutton, like beef, is best broiled over a charcoal grill that cooks without charring, burning or drying, and is fairly well done. In our experience we have never seen a case of sickness from mutton except as noted above in fatty ills, nor known of a reported case in medical society or journal. This is not saying there may not be such. It simply shows that mutton is not, as a rule, with some exceptions, a pathological food to the healthy.

Mutton is best when roasted, or if boiled it should be eaten with the broth, which to the palate, and afterwards, acts with all the phenomena of good nutrition. Lamb is more tender than mutton and very much better dietetically.

Multiple food: It generally makes the piece of resistance of a meal. Not often is it eaten alone. It would be well to do so, as then, we think, the fat might be so assimilated as not to produce the tendency of return of the fatty ills. One food is easier digested than two foods, and so on. A bad food singly is not so bad as when eaten with many others, because every superadded food takes so much more force for digestion. The average person does better to do one thing at a time and if human stomachs could do likewise human disease history would be less bad.

Cures: If we can call beef the physician, we can call mutton the first assistant. Always when the sick man tires of beef, he can turn to mutton for a change. It does not need to be chopped. Steaks from the hind legs are the best. The chops are too fat. Leaving out the fatty ills cases, mutton might be tried when beef could not be had or where the beef was very poor and even in necessity that knows no law, mutton would be the best food to use if no beef preparations could be had. Just as milk has been used in Bright's disease, not with the effect of removing the albumin, casts, and fatty epithelia, but with that of keeping comfortably alive.

The head: Certainly good; the deaf mutes could not have such a record of nine successive years and in that time have one pupil who, it is said by some, breaks the record of the wonderful Helen Keller. The easy digestion, tenderness and nutrition of mutton and lamb do not produce gases to paralyze, more or less, the head.

Heart and muscle: Good, but not so hearty and hale as beef. The conventional idea of being too "hearty" for the sick is not so prevalent as it is in relation to beef. People are generally not so afraid to give lamb and mutton to the very sick as they are beef. Mutton does strengthen the heart and muscles of the well and sick next to beef, and this, whether it is done by toning up the nerves that supply force to the said muscles or by endowing the muscular fibrillæ direct. The only objection is the excess of fat; such taking the place of muscle is a degeneration. It is more difficult to exclude fat from mutton than from beef, hence lean beef is better than mutton. The peculiar physical arrangement of the blood vessels of the heart (which in itself is a blood vessel), going down to a point and then more or less backwards, makes it easy to retard or impede the blood supply of the heart tissues. Hence, if there is too much fat in said sheep food, the chances are that it will be deposited in excess on the heart or heart sac (pericardium), and by the side of the heart fibrillæ, if said fat does not usurp the place of the muscular fibres; the same thing may be said of the muscles elsewhere; further, if the eater does not exercise, or puts dress ligatures about the limbs or body, enough to retard and impede the circulation, fatty ills will result. The same is true to a less extent as to fat beef and to a greater extent with food from the vegetable kingdom.

Eyes, hair, teeth, nails, bones: Mutton and lamb are good for them all; their mineral elements suffice. This is not saying that no disease of said organs occur among mutton eaters, but that there would be more if they did not have said sheep and lamb to eat. Distinguished oculists state that dyspepsia is a great cause of eye diseases. Dyspepsialess mutton and lamb ought to make them less. If diseases of the bones and their allied organs come from deficient mineral foods (other things being equal), then mutton and lamb, that furnish said mineral elements in normal and assimilable amounts are foods for said organs. Possibly the excess of fat in sheep might disease the above organs because of their density and intricacy of structure. We have seen cases of too much marrow in bones, also fat in falling hair. Fatty ills are the bane of the eyes and a weakness of the constitution, no matter how caused and give deficient, fragile and feeble nails; so fat mutton is the rock to look out for on the charts of the sea of life when we are navigating to have good eyes, bones, hair, teeth and nails.

Intestines: Mutton and lamb are well suited to them because of their tenderness and not furnishing digestive problems hard to solve.

How often used: Can be lived on twice a day.

Sole foods: Over 40 days at least.

Heat units: Of the muscular parts of lamb and mutton 655 is the lowest and 2090 the highest; fat of kidneys, 4065. On the chemical side, mutton is one of the best of all foods. Beef heat units from loin trimmings 165 to 3965 of marrow. It is found that marrow and kidney fat cannot be eaten enough to sustain life and that if they could they would induce obesity and fatty degeneration.

Force: Certainly, as from its physiological history, next to the force of beef, which is accorded the highest place in the training of those to undergo great exertions. If there was a way to remove the white fibrous tissues and fat, as is done in lean chopped beef, possibly mutton and lamb would be equal to beef. Sheep are best in mountain regions, where the people need much force to live. The fresh, pure air food furnishes a good deal, as is seen in the increase of force of a plain dweller living as a mountaineer. Generally men from the mountains are very stalwart and strong, if they feed on sheep; they also have goats (of the same ovine family) and game. We do not hear of mutton being salted or preserved like beef for the army and navy; it is cheaper and would be thus used if just as much strength producing, we think. In our native town there was a man who was called "Mutton"—who kept his family on mutton and lamb because cheaper. Such diet did not add to the respect of his townpeople and his appellation was a term of mild derision; but he had force equal to his station, earning a competency, and in some few ideas he led public opinion with a good deal of energy, wit and reason.

Climate: Temperate and cool climes are suitable. The thick wool forbids warm climes.

Ethics and customs: They have figured and figure as one of the most important meats on the tables of the lowest and highest. Even public festivals of conquerors in war have been called "ovations," because, some say, of the sacrifice of ovines (sheep).

Aesthetics and fashions: If the French are world leaders in this respect, for their use of mutton and lamb is largely in excess of all other meats, then these meats answer fully the requirements of palatal and bon ton standard of beauty. No nation excels the French in its cuisine of mutton and lamb. They are said to look with pity on the cooking of other nations as not coming up to their æsthetic tests of good looks and good taste.

Religion: The Hebrews from 2347 B.C. to the Jews of to-day have made close connection of these nouns; the 23d Psalm begins: "The Lord is my Shepherd, I shall not want. He maketh me to lie down in green pastures. He leadeth me beside the still waters;" all types for sheep husbandry, true not imaginary, and the finest figure of poetical imagination, as fresh, bright and realistic to-day as when uttered more than 4000 years ago. The Latin and Greek churches forbid the use of lamb and mutton in Lent and on Fridays.

Skin: Mutton and lamb are good skin foods. The use of lanolin has already been noted. Mutton tallow would make a good ointment base but for its solidity. In chronic eczematous disease not accompanied by fatty degeneration it would be well to live on lamb and mutton to starve it out by making its habitation strong enough to kill it.

Fermentation: Lamb and mutton properly selected and prepared are not subject to fermentation in the alimentary canal. Of course they will decay with putrefactive destructive fermentation after death if not rightly kept, like most other dead animal tissues, but these are not in our range of food, as they are out of common-sense limits. These foods usually digest and do not wait to ferment.

Parasites: 1st, sheep bot, fly or larvæ, infest the nose and frontal sinuses; 2d, sheep louse or tick; 3d, a mallophagus insect (Trichodectes sphærocephalus) in the wool; 4th, sheep scab, which the United States Government is fighting with original measures and success; 5th, measles or hydatids, larval forms of tænia or tapeworm. Cooking will destroy all these.

Intemperance: Gluttony of lamb and mutton is practically unknown.

EGGS

Hen's eggs are here taken as a type; they are called a universal food, as they are eaten everywhere, specially in the South. Vegetarians who say they eat no animal food rank them with milk in their diet lists. Travellers use them because they are free from solid dirt and if fresh they are presumably free from aerial (gaseous) and liquid dirt.

Natural and unnatural, as they are eaten raw, cooked and mixed with sugar, flour and almost every food, as cake, etc.

Fashionable, as the elite include eggs in their food.

Organic: Will burn and are formed inside the body.

Kingdom, animal: It is impossible to see how they can be put in the vegetable kingdom, formed as they are.

Good and *bad,* just like other things. About the first thing an eater does is to settle this question by the wonderful tests of the senses.

Physiology: One of the best concentrated animal foods, good for head, heart, bones, teeth, hair, nails, etc. Furnish heat healthfully. Are force giving. Beautiful, as the colors of the whites and yolks have stood the test of the love of the æsthetic in food; indeed, bakers and confectioners make livelihoods with the aid of eggs; the wealth of eye food at banquets consists much in the lavish display of eggs as food material in custards, ice-cream, candies, cakes, etc.

They furnish food for every tissue, solid and liquid (blood), save water. Man can live on eggs and water for some time and thrive, with exceptions given below.

Disease: The yolks by difficult digestion cause the deposit of cystin crystals in blood and urine, as shown by the microscope. The oily matters in the yolk will keep albuminuria a-going, *while the whites will help remove it,* and are not so nutritious as the whites.

Chemistry: Eggs contain all the elements needful for food, save water, and the combinations are such as to be easily digested, save exceptions given herewith.

If well, eaters can use both yolks and whites; if sick, they can eat the whites and recover tone, so that they can then eat other foods. It is understood that the whites should be cooked by dropping in boiling water and then allowed to moderately harden, or use them raw.

(The whole body of the chick is produced from the whites, while the yolk is food during the first days after hatching.)

Eggs are *mental food,* as they furnish a healthy body for the mind to dwell in. Eggs badly cooked or overeaten will cause dreams.

A remarkable change occurs in the thick liquid yolk by heat in cooking, say boiling, *i.e.*, into beautiful yellow crystals; the mealy condition of the yolk is due to this; the usual physical change of liquids from heat is evaporation and condensation; but it is thought to be rare in physics to have crystallization by heat, as cold and evaporation crystallize water and solutions of salts. Melted metals on cooling deposit crystals if the cooling goes on slowly.

The white of egg becomes more solid on heating, but there is no crystallization so far observed.

The formation of the complex salt cystin in the blood and urine, before noted, comes from the yolks, because of this tendency to crystallization and is a potent cause of one form of rheumatism. (*See* Beef and Uric Acid, illustrations.)

PORK

Is it food? Many consider it not fit to eat. In this case they are supported by the Bible when in 1490 B.C. swine were forbidden as unclean and their eating was among the most odious of the abominations charged upon the Hebrews, but under the new dispensation its eating is allowed. "Galen 130 to 200 A.D. most commended swine's flesh above all kinds of flesh in nourishment of the body, if it be not of old swine and well digested of him that eateth it and that it giveth more steadfast and strong nourishment than other meats be proveth by experience of great wrastlers, who if they ate a like quantity of any other meat and withal use like exercise shall feel themselves the next day following more weake than they were when they fed on pork" (Cogan). The experience of every mining region demonstrates that salt pork is the most nutritious and stimulating diet for miners, whose labors are the most exhausting in the world. (A. D. Richardson, Beyond the Miss.)

A federal soldier who served in Virginia in the Civil War voluntarily stated that the soldiers got more staying strength from salt pork than any other army ration. The cure of a case of double pleurisy and tuberculosis is a further evidence of the value of pork. (*See* Food in Chronic Disease.)

Good: Pork which is fed on sour swill, garbage or filth is not good, for such produces tuberculosis in swine, so that here the question of goodness is one of feeding. In 1877 a packing establishment in Massachusetts where 300,000 hogs a year were killed was visited by the senior writer; there were more than a thousand swine from the West in a large pen lying down and taking their last breaths; he was agreeably surprised to find the hogs were the healthiest he had ever seen; they had been fed out of doors on good, sound corn; then he witnessed the slaughtering and dressing; the viscera, lungs, liver and intestines were healthy; since then the senior writer has maintained that healthy pork was wholesome food.

Bad: Pork is specially subject to tuberculosis, because the conventionally fed hog has to live on sour swill, *i.e.,* food decaying with the alcoholic and specially vinegar fermentations, exactly as a man when fed on such food, as sour bread or dough, may die of tuberculosis. (*See* Fermentation.) But because the heat of cooking thoroughly destroys the tubercular vegetations, we do not think that pork can convey tuberculosis to man, unless eaten raw. If it did the mortality would be greater than it is. No doubt the germs of tuberculosis invade all, for they have been found in healthy mouths, but constitutional vitality offers a very inhospitable nest and the vegetations therefore do not grow.

Condition of eaters: Makes all the difference in the world; let those whose constitutions have been impaired by any cause eat said tubercular pork (which, of course, none advise), but which through carelessness, neglect, or greed will find its way to the tables of man, then we might expect bad results. Those who work out of doors in winter find sound pork to agree with them and give great sustenance and power. While pork is preferably eaten by the outdoor workers, still it must not be denied to the ill when beef cannot be had, but attention must be paid to the soundness of the pork to begin with. (Hogs do not choose to live in filth if they can help it. When their pens are departmented so that they have a clean place to sleep in they keep it clean and remarkably so under unfavorable environments. Most animals will care for cleanliness if they can.) Cogan thinks pork poor food for students with weak stomachs to be commonly used, because of sedentary occupations. This is right.

Morphology: Some think that the flavor of pork is so like that of man's flesh that some have eaten it in place of pork. Somewhere it is stated that the cannibalism of the Fiji Islands was a modern invention clearly within the memory of persons living. Anatomy shows the inward parts of man are very much the same as those of swine. We have never cannibalized any but ourselves by starving, and so cannot speak authoritatively as to the taste of pork being like that of man. The outside pork anatomy differs from man's. Hogs have fat like whale's blubber. Fat men on post-mortem examinations do not show a like arrangement.

Chemistry: United States Government gives four pages of analyses of pork, from which we quote a few as follows:

Lean ham as purchased: Refuse 42.4, water 35.7, protein 10.7, fat 10.6, ash .6, heat units 645. *Edible portion,* average: water 62.8, protein 18.5, fat 17.7, ash 1.0, heat units 870. *Smoked lean ham,* edible portion, average: water 53.5, protein 20.7, fat 24.4, ash 5.8, heat units 1415.

Smoked fat ham, edible portion, average: water 25.5, protein 15.4, fat 55.8, ash 3.3, heat units 2640. *Bacon,* smoked, lean, as purchased: refuse 9.6, water 29.6, protein 14.9, fat 40.8, ash 5.1, heat units 2000. *Arles sausage,* edible portion, as purchased: refuse 5.2, water 16.3, protein 23.6, fat 48, ash 6.9, heat units 2465. *Sausage meat,* as purchased: water 46.2, protein 17.9, fat 32.5, ash 3.4, heat units 1705. *Pork sausage,* as purchased: refuse 12.6, water 49.5, protein 14.5, fat 21.6, ash 1.8, heat units 1500.

Compare with good beef sausage: Water 59.6, protein 17.8, fat 20.6, ash 2, heat units 1200. Twelve of the pork analyses give carbohydrates, while beef (10 pages of analyses) show 8 such present. Veal and mutton (5 pages of analyses) show 3 presences of carbohydrates. According to the chemical standard, pork is a good food, but not quite up to beef.

Physiology: Ham (and moderately salted beef) are good food when the bowels are filled with yeasty conditions, as such do not ferment readily, hence offer less problem for the alcohol and vinegar yeasts. Pork should be put in the side dishes in this order.

Disease: Opponents give a fearful list of diseases caused by pork, of which scrofula is the greatest; but pork to cause havoc must have been badly diseased. Trichina and tapeworm come from measly pork, but if said pork had been thoroughly cooked they would not have propagated said parasites.

Sole food: As beef and mutton are ranged at the far limit, it is safe to estimate the limit of pork to about 20 days, more or less. It would be well for the United States Government to test this, as pork is an important part of the army's rations.

Multiple food: Almost always people could make a meal on pork alone, but do not do it.

Cure by feeding: As pork is a side dish, capable of sustaining healthy life for perhaps 20 days' sole feeding, as beef is unlimited in its range for sole feeding, and as with beef alone it is often a hard fight for life in chronic diseases, we have not felt it right to prefer pork to normal beef. In cases of diarrhœa, where the beef, climate and local conditions were not normal, we have found smoked and salted ham to arrest said diarrhœa almost at once. Very salt food will not ferment nor digest well, but there is a happy medium to be obtained by soaking in water the salted ham, until a moderate amount of salting is to be had.

Head and nerves: Good for them. Instances are on record where hydatids have been found in the brain which have come from pork trichina larvæ, but this is due to improper cooking.

Heart and muscle: Good pork helps the heart and muscles. Cogan's dictum as to English laborers before 1585 thriving better on pork than on any other meat supports the idea that they were men of muscle, the heart specially. Other testimony here noted bears out this theory.

Bone, eyes, teeth, nails, etc.: All these thrive on wholesome pork.

Intestines: If wholesome and fed solely, pork is a good means to reduce enlarged, distended, thickened or dilated intestines, far ahead of any surgical means. Beef and mutton are better; those who live on such meats have rarely strictures of the intestines.

Heat units: Government analyses give 3855 heat units of back fat, down to 295 of flank cut. The average heat units are higher than in beef, our standard so far. From the chemist's point of view, pork should stand highest, but the fat excessively used will produce fatty degeneration, obesity, etc., as noted in other lines of food.

Force: Certainly, or it could not serve so well in the diet of laborers, soldiers, sailors and farmers. On many farms it is the great source of force to the husbandmen. Fresh pork is a favorite food for soldiers on the march; if in the Civil War there were any live hogs anywhere around, they would be cut in small pieces and roasted on bayonets at rail fence fires and all eaten up in the course of 20 minutes and give the soldiers staying power.

Natural: Yes, for the most part save in sausages, smoking, salting and packing.

Climate: Suits all climates. Again it is a curious ethic, or custom, that makes pork the standard meat all through the south of the United States and South America; perhaps it is because beef is so poor and dear and hogs so cheap.

Aesthetic and fashionable: Found on the tables of the people who live to cultivate society. Perhaps roasted young pigs garnished with celery, beets, cress, carrots, etc., form one of the best conventional monuments of culinary art at a fashionable banquet to please first the eye and then the palate.

Religion: Figures very largely in ancient religious history. Forbidden in Leviticus 11:7; called clean in Acts 10:15. The Hebrews held it in such detestation that they would not so much as pronounce its name. Eating pork was amongst the most odious of the idolatrous abominations.

It is said that the Greeks and the Romans used to sacrifice a hog to Ceres at the beginning of the harvest and to Bacchus at the beginning of the vintage, as swine were hostile to the growing corn and loaded vineyard. In modern times, it is said that the famous insurrection in India against the British was excited in the predisposed condition by the use of lard in place of tallow to grease cartridges. "The Encyclopedia of Religious Knowledge," from which some of these statements are culled, also says the hog delights in fetid mire, reposes in mud by choice and wallowing seems to constitute one of its greatest pleasures. Peter quotes the proverb, the sow that was washed is turned to her wallowing in the mire. The Latin church prohibits pork in Lent and on Fridays. Somewhere we have seen stated that hogs will not eat dirty food unless obliged to or starve. A raiser of hogs for thirty years in Virginia says that hogs will be as particular about the choice of their food as human beings, and also if possible keep themselves clean. (So observers differ.)

Effect on skin: We have seen pork, eaten fresh, produce nettle rash or urticaria, but it generally passes off soon, is a mild affection and usually comes from overfeeding that disturbs the vicarious functions of the skin and alimentary canal. Fat pork moderately used, must give supplies to the sebaceous follicles of the skin and make them supple and soft. (Chinese women are said to eat rats for this purpose.)

Fermentation: Sound well fed pork does not ferment very much; when excessively or unduly fat, it may be too much for the pancreatic and hepatic secretions and therefore ferments; but fats are not easily fermentable as the carbohydrates are.

Parasites: (a) Hog cholera (tuberculosis), not infective; (b) Swine plague, infective but scarcely distinguishable from hog cholera; (c) Swine pox, varicella or chicken pox; (d) Trichina; (e) Tapeworm, measly pork, (*see* Beef—Parasites); (f) Scarlet fever or scarlatina; (g) Rubeola; (h) Roseola. A curious fact is that hogs will stand the bite of rattlesnakes and delight in rattlesnake diet.

Intemperance: Hogs will not eat preparations in which is alcohol and get drunk. Man does not often indulge in the intemperate eating of pork, as he soon gets surfeited. Of course it is possible and urticaria may follow, but pork does not cause a strong craving. If pork fat is used intemperately, we should look for nausea and vomiting that would stir all the powers to repulsion.

Sausages

are finely raw chopped pork, mixed with seasoning and put in the prepared entrails of other animals; thus they keep a good while. For well people, when well cooked, they serve as occasional dishes. New England sausages are much fatter and harder to digest than those made in New York State; probably this is due to the mixing of beef with the latter. Wisconsin sausage is the best and when properly cooked is commended for use. They are good force producers. *Allantoxicum* is the poison of putrid sausage made of liver and blood, a preparation not allowed by us.

POULTRY

Hens, ducks, geese, turkeys: Have been used extensively by man as food for ages; as many regard eggs as vegetable, it is needful to insist that poultry are in the *animal* kingdom.

Good: When not diseased; all cannot live on poultry, but the average person will thrive for a time.

Morphology: There are two kinds of meat, white and dark; tests of the blood and urine of feeders show that the dark meat is better than the white.

Sole food: The best example is the biblical, when the Jews in the wilderness fed on quail for one month and then it became loathsome. So far as our experience goes, the above time is shortened; further evidence solicited.

Manifold food: Usually eaten with other foods and mingles well.

Badness: Sometimes bad from disease, bad feeding and bad preparation. Poultry feed on all sorts of vermin and food unsuitable to man, and the custom of leaving the entrails undrawn is specially dangerous; ptomaine poisoning may occur; cooking minimizes the evils but not altogether. The junior writer some years ago had occasion to treat a severe case of ptomaine poisoning due to eating one club sandwich. We have also been taught that there are vegetations in the white meat and not in the dark. Cooking helps to kill them; but the example of Philadelphia should be followed everywhere, requiring all poultry to be drawn as soon as killed. (Hen oil is a peculiar substance. Aristol dissolved in it and ether introduced into the rectum has been tasted in five minutes. With such penetrative powers, if the fowl is diseased, the oil may make trouble.) Those who live largely on delicatessen poultry have their troubles.

Cures: Does not cure disease by sole feeding; instead, the oil, with the tendency to fermentation of the white meat, tends to throw albumen, casts and fatty epithelia into the urine in cases enfeebled by disease.

Heart and muscles: Not equal to beef, wheat or whites of eggs.

Eyes, hair, nails, teeth, bones: Fairly good.

Intestines: Unless fermentation of white tissues, is a good food.

Force and heat: In the former not up to prime foods here noted; heat abundant.

Climate: Is food everywhere.

Cooking: Roasting in closed Papin's pans or cooked in its juices; broiled; fricasseed; never should be eaten raw.

Aesthetics: Highly fashionable; the North American bird called turkey (erroneously thought to have come from Turkey) is perhaps the best of all and its festive uses need no mention here.

Religion: The Latin Church bars poultry on Fridays and certain other days; otherwise does not figure.

Builder of tissues: Certainly.

Parasites: (*See* same under Beef.)

Intemperance: The case cited of the Jews was compulsory. We know of no others.

FISH

We find fish in the Bible from the first chapter of Genesis 4004 B.C. to the New Testament A.D. 59, and in the markets and waters of the present day. All with scales and fins were esteemed food and much used by the Jews. "Of the deliciousness of the fish, held to be sacred of Egypt, all authors, ancient and modern, are agreed." The ancient Greeks and Romans ate fish as mentioned by Ovid (Cicero). Cogan, 1585, says fish "is no small part of our sustenance in the realm of England. The felicity of Great Britain for fish, Dr. Bond, a great traveller, witnesses in his diary, 'that no nation under the sunne is better served with all manner of fish.'" The use of fish on fast days, Celsus confirms by noting that there is less aliment in fish than in any other meat and Cogan agrees to this; we do also, save as to the flesh of clams, swordfish and salmon.

Animal kingdom: As they breathe, by gills, air suspended in the waters and give off carbonic acid gas.

Mental kingdom: Certainly, as the mental powers have for ages allowed fish for seasons of increased spirituality. Our New England forefathers had a high type of spirituality and thrived on shellfish. There is something peculiarly festive about soft clams. At a clambake, there is a great flow of animal spirits.

Good: Certainly very wholesome with above antecedents, provided they are in good condition. Codfish and soft clams are the best.

Bad: If improperly fed in waters of filth, sewage and disease germs, or if improperly cooked. A late report makes the London *Polyclinic* say that fish is the cause of leprosy. But leprosy is found most in rice eating countries, more than in fish eating; however, as fish is not so strong a food as beef, mutton and pork, we might expect leprosy to invade fish eaters on general principles, especially if it was salted, which impoverishes by extracting some soluble nutritive salts of the fish, but we are considering them as a whole.

Condition of feeders: Are for the sick or well; we have seen the very ill use fish for food, as in a broth; or soft or hard clams steamed and the juices used with profit. Once a patient who could not take anything else suggested, found most acceptable and nourishing a broth of fresh water perch. Raw oysters agree with almost everybody, save those in tuberculosis.

Morphology: Fish as a rule are tenderer than other food. The bodies are more muscular in proportion than beef. The cavities and the viscera are smaller. The bones are not so strong as those of cattle; more flexible and in some more numerous. The shad is a fine example of elastic boned fish formed in a continuous network, so that they are very agile and supple. The swordfish has a reddish muscular body with a longitudinal central skeleton of bone, which is harder than that of most fish. There are fish with the bones inside, but there are fish with skeletons outside called shellfish, as the oyster, clam, lobster and other crustacea. All fish require less cooking than mammalia or cattle. A very peculiar thing about fishes is their scales, which under the microscope are beautiful and polarize light exquisitely; certain glands produce a secretion of a fishy odor which probably prevents the action of osmosis of waters. There is a glue from fish which has long been used as a delicate food (isinglass), though it is doubtful if it is any more than a glue of the carbohydrate kind. Be this as it may, fish glue is far better cement than cattle glue. The anatomy of fish makes cooking by steam the better method.

Chemistry: The United States Government has gone deeply into this. We have space only for a few quotations. *Codfish,* dressed, as purchased: refuse 29.91, water 58.5, protein 10.6, fat .2, ash .8, heat units 205. *Cod,* salt, as purchased: refuse 24.9, water 40.3, protein 16, fat .4, ash .18, heat units 315. On these grounds salted is better than fresh. But biologically it is not. *Yellow perch,* as purchased: refuse 62.7, water 30, protein 6.7, fat .2, ash .4, heat units 135. Perch in our experience is the best fresh water common fish for food. *Brook trout:* refuse 48.1, water 40.4, protein 9.8, fat 1.1, ash .6, heat units 230. *Salmon:* refuse 39.2, water 39.4, protein 12.4, fat 8.1, ash .9, heat units 570. The fat is large in amount and this fish is not suited for cases of fatty ills. *Swordfish:* no analysis; we regret this because it is a good force conferring food. *Oysters* in the shell as purchased, average of 34 examinations: refuse 81.4, water 16.1, protein 1.2, fat .2, ash 4.0, heat units 45. *Clams:* soft, average 4 examinations: refuse 41.9, water 49.9, protein 5, fat .6, carbohydrates 1.1, ash 1.5, heat units 140.

Curiosities: The carbohydrates and small heat units; on this account the chemists would not say they were good food, and yet we have known a meal of soft clams to stand by one for 24 hours better than beef. *Quahogs:* refuse 67.5, water 28, protein 2.1, fat 1, carbohydrates 1.4, ash .9, heat units 70. A very poor food in this showing, but the broth is very nourishing and the meat stands by you long, if not too tough; will bring back fatty ills not permanently removed; not equal to soft clams. *Scallops:* maximum, 2 specimens: water 72.8, protein 15.1, fat 3, carbohydrates 5.6, ash 1.5, heat units 385. Scallops are sweet and very nutritious; they have 40 to 50 beautiful eyes. Only the adductor muscle is eaten. *Green turtle:* refuse 62.4, water 19.2, protein 14.4, fat 1, ash 3, heat units 85. We have found a snapping turtle to give a hearty meal. We thought it ought to because its heart, separated from its body, beat rhythmically for 24 hours at least. The low number of heat units does not explain the wonderful persistency of the autonomy of the heart.

Physiology: The tenderness of fish as a rule makes them a good food to digest. The odors that come from a fish in frying are nasal music to a hungry sportsman, just in from a hard day's "fish"; likewise the crackling of the fat. These affect his spirits, stir up his appetite and make him more anxious to have some fish palate music. Fish are thus a relish.

We have known a patient who had been very ill of typhoid pneumonitis, languishing at the mountains during convalescence. She expressed a wish for a fish dinner, which was had at a famous Boston fish restaurant and served its purpose, for from that time the patient recovered her appetite for other food and was rapidly restored. A clambake is physiologically next to a barbecue.

Disease: The deterioration of fish kept out of water by dying and decomposition is rapid. Stale fish have poisoned people. The worst forms of nettle rash or urticaria come from eating shellfish too long kept or not. Tapeworms also come from fishes. Oysters sometimes have typhoid fever bacillus from sewage drainage. The quality of fish is varied by cooking or by heat that coagulates the albumin. Fish excessively eaten will produce cystinic rheumatism. Cogan says that fish in the salt seas and running waters are much better than those bred in stagnant ponds and lakes. This would be expected, as waters in motion absorb more air and there is more life.

Soft clams are strongly impregnated with sulphuretted hydrogen when bedded near stagnant water bogs. Marketable fish with these exceptions are not disease causing when properly kept. But all cannot eat clams.

Sole food: We cannot tell exactly. They are put next to game in rank. As beef and mutton can be lived on much longer, we conclude that fish cannot be fed solely longer than 40 days.

Manifold food: As a rule in certain localities, it often forms the chief article of food at a meal, but rarely is fed alone.

Cure by feeding: Fish, especially shellfish, are good to cure loss of appetite, malaise, dyspepsia. They are good as side dishes when a patient is tired of beef and mutton. Soft clams are especially good, as clam broth or also fried à la Young's Hotel, Boston. There are possibilities of cure of disease in the swordfish, which may, with soft clams, supplant codfish on the menu of strict diet cases, as both these exceed the latter as power conferers. Debauchees worn out by excesses go to the seashore to recuperate, and do so more quickly by eating soft clams than on anything else. We think that sole feeding on soft clams and swordfish for a change would be a fine diet for insane asylums. The conventional diet of people predisposes to insanity when the carbohydrates hold a high percentage. Chronic cases of disease ought to have food that has biological superiority as well as chemical. Some fish are such foods.

Head and nerve food: Some fish are and some are not. Fresh caught tautog do not give nerve force for the head. Soft clams and swordfish furnish it abundantly. Hard clams would, but are too tough. Salmon also furnishes some. Codfish does, but in a lesser degree. Fresh water perch furnishes it. Fresh, properly cooked lobsters, ditto. Nearly all other fish we have found not good nerve food. Eels are good if not too fat. Oysters, so much prized, are not a great nerve food, but it takes less nerve force to digest them than when cooked, unless done as we once saw them in a restaurant; this stew was prepared as follows: the liquid part was run up to a boil, then from the refrigerator were taken the solid oysters and immersed in the boiling liquid, which, of course, was cooled by the ice cold oysters; after bringing to a boil they were served—a dish fit for a king. In this connection the nerve use of fish on fast days in the Latin and other churches for ages shows their officials believed and believe that fish are more nerve promoters of intellectual appreciation of spiritual truth than beef, mutton or pork, possibly because fish rightly cooked is so digestible. But we have never seen any signs of great intellectuality among people who lived largely on fish. There are far better nerve foods than fish, save those named.

Heart and muscle: The relishing flavor of fish must aid the nerve forces of the heart, as it does sometimes excite a desire for food, also having a stimulating effect upon the heart, whence the desire is strongly felt to become the partaker of said food. Not but that this exciting odor is found with other foods, meats, etc., but that of fish penetrates longer distances in full action. Bulk by bulk, fish is less a muscle food than beef and more transient. Fish does not strengthen the heart muscles like whole wheat, except clams and swordfish.

Eyes, hair, bone, teeth, nails: If wheat has of ash 1.6 per cent., if entire wheat flour has 1.2 per cent. (to name no more), and are standards for heart feeding, then soft clams with 1.2 of ash and round clams with .9 per cent. of ash must fill the bill also. Codfish varies in percentage of ash from .6 to 1.3 ash. Perch, white and yellow, varies from .4 to 1.3 of ash; trout from .5 to 1.4 per cent. of ash; halibut .7 to 1.2 ash; smoked salt herrings, entrails gone, 7.4 to 13.2. These are all good foods. We refer to the valuable reports of our Government for more of these interesting facts.

Intestines: Generally fresh fish, being so digestible, agrees well with the intestines; but salt and smoked fish are liable to disagree; the creosote and salt are good for fermentative conditions of the alimentary canal, but they must be moderately used. No doubt tapeworm occurs sometimes as we have seen them in fish, but cooking will prevent this by coagulation. Oysters are conventionally known to produce in the United States intestinal diseases during the months with no R in their names, and are noted for typhoid fever when infected. But clams are edible in the hottest of weather, due to the large amount of salines in their fluids. This is not wonderful, considering the power of assimilation of their shells from the lime of the sea. At any rate, this is a fine thing in favor of clams to be edible the whole year round and especially during the months when intestinal diseases are common. Clam broth is a fine medicine for ordinary diarrhœa. Clams are best prepared by steaming.

Heat units: These run low. Out of 59 analyses on one page of our Government report, 44 were less than 500 heat units, while salmon and mackerel were 1125 and 1025. Caviare has 1530, the highest. Salmon and mackerel are not a good food in fatty ills. The highest heat units of clams, 340 for round and 225 for long, are not at all in keeping with their biological value as food.

Force: Save clams and swordfish, these correspond to those of poultry. Even the excellent codfish and halibut are not so full of force. We wish the staying powers of fish might be further investigated as a means of national wealth. From our experience we believe that soft clams, Mya arenaria, ought to be protected like cattle and swine; as it is now, they are being destroyed for want of protection, as experiments in clam farming in Massachusetts have shown. The product value was $1000 per acre. We have seen it stated at $1500; a greater sum by far than any other agriculture, dry or wet. There are, all along our coasts, desert places where clams could be raised. We are glad to encourage clam culture, because they are so valuable a force food—festive, salubrious, strong. The clam eggs are deposited in June and mature to marketable state in less than a year. The United States Government has done fine work for oysters and has brought to notice the use of the abundant forms of life called diatoms as food for them, a thing which is very pleasant to microscopists, who have made so many studies and photographs of said diatoms. Now let us have as good work done for clams. One reason we think for the sturdy citizenship of the New Englanders in the seventeenth century was their clam and mussel diet.

Climate: Fish are found in all climes and are said to be especially found in the tropics, wherever there are waters for them, and are suited as food for any climate if used with common sense.

Natural: Civilized man does not eat fish raw, save oysters, clams and other shellfish, unless necessity compels, as in shipwreck or starvation otherwise. Smoked and salted fish, as herring, codfish, etc., are eaten raw, but these are not in their natural state. All other animals, fish included, eat fish raw, abdominal contents and all, apparently with impunity. It is found by experience that the nearer to natural conditions of life, fish are cooked and eaten the better they are, as they deteriorate rapidly after death. Dry, jerked and picked, are changes of the natural fish to keep them. Of course the salting removes their nutritive salts, but ethics have not gone in to impoverish fish like wheat. It is well not to eat natural fish, with the exception noted, because of tape and other worms. Steaming, as in clambakes, is the best way to cook fish naturally and preserve all their nutritive qualities.

Aesthetic and fashionable: Certainly they figure on the tables of the most recherche banquets. A large salmon cooked whole and garnished is a fine centerpiece of gastronomic beauty; so of turbot, white fish, cusk, cod, etc. Fish also furnish beauties of palate music; their perfumes dispense a music of smell and when some fine string orchestra provides ear music, the occasion blends into a symphony of the harmonies of the taste, the smell, the eye, ear and touch.

Religion: Fish, of course, figures largely in the Bible; and the great Latin and Greek churches, to name no more, allow fish on fast days and in Lent for many generations. There is no doubt that fish by many religionists are deemed more suitable to maintain spirituality than beef, though lambs have been and are eaten at the feast of the Passover.

Builders of tissue: Yes, but clams and oysters are especially good.

Skin: Good, save that some shellfish produce urticaria or nettle rash, because they disagree with the intestinal digestive powers; we believe, however, the trouble lies with the unwholesomeness of the said fish for the most part; still idiosyncrasies have something to do with it, according to the adage "one man's meat is another man's poison." The tenacity of the glue tissues of the skin of fish ought to be good for man's skin.

Fermentation: Save shellfish when taken from the water, they rapidly deteriorate. One hot summer day, the senior writer went mackerel fishing in Massachusetts Bay. In a short time there were caught more than half a barrel full of half sized mackerel. On reaching shore they were not fit for food; spoiled by heat. Wholesome fish, fresh and properly cooked, are not very fermentable, as they usually digest well. Again, odious odors of fermenting fish will deter almost any one from eating.

As a rule, with exceptions, fermenting and decayed fish are unhealthy; people may gradually acquire the habit of eating such and their systems become tolerant, as the Styrians tolerate arsenic and get fat and handsome with doses that would kill those who had not been used to such.

Parasites: a, Clathrocystis rosea-persicina often found on salt codfish in hot weather. b, Fungus, saprolegnia ferax on salmon and other fishes. c, Fish killer, a large belostomid water-bug. d, Fish louse, a small crustacean, as a lemeid. e, Fishworm, *i.e.,* tape in hydatid and mature stages. Also found in the sea water where clams live.

Proper cooking destroys most of these parasites. Decayed fish should not be eaten any more than decayed or rotten apples.

Intemperance: There are no instances on record of a nation intemperate with fish, as the Israelites were with quail. At a clambake on the shore of Buzzards Bay, among the cottagers a few years ago, there was a great abundance of fish food eaten. Some expected sickness. There was none, because of the superior excellence of the steam salt cooking, thus furnishing light work for the digestive organs. We know very little intemperance from fish eating proper. Years ago in Massachusetts, when apprentices were indentured, a clause was written that salmon should not be fed more than three times a week, as it was so plentiful. Now, a great many would be glad to have it once a month.

COFFEE

This is universally used at many or all meals, and consequently classed as a food.

Fashionable even to the lowest orders of society who can buy it.

Natural though not eaten raw. It has many varieties. A coffee broker lately visited had 1,000 little trays for testing different cargoes. An examination showed visible peculiarities by which the expert could name the large number of varieties even before subjection to roasting, grinding, hot infusion, that is with water, taste, smell.

Does climate affect it? Very much, as the broker showed. It seemed as if climate affected coffee as much as it does man in coloring the races. And the climate also makes a difference in the effect of coffee on the system, which demands it most in temperate climes.

Vegetable kingdom: It grows on a bush that burns (organic) ; as it is never used waterless, it therefore combines with the mineral kingdom. The virtues of hot water are given over to "coffee" sometimes.

Condition of eaters: Some cannot use it. The Rev. Peter Kimball, of Perth Amboy, was over ninety years of age at his death. When thirty years old he found that coffee and tea kept him awake nights. He had not used either since and thought his longevity was partly due to his abstinence. He was a fine specimen of an almost centenarian; no doubt his regular nightly sleep lengthened his life and he was wise in not using what did not suit him, like horses, dogs, and cats who will not eat what does not agree with them. There are others who have used coffee to like age. In the strictest plans of diet, almost always it is allowed and patients can generally take it, which is saying a great deal. Of course we mean that coffee which has stood the tests of brokers. Again coffee could not be used as it is, were it not good for the majority.

Main food: Generally used in combination with others. A young man said he was in the habit of drinking coffee for his midday meal; eating nothing else. His head was so much disturbed that he sought advice, which was to stop such coffee taking. It cannot be lived on alone, as will be seen further on.

Digestible: Yes, as food in solution generally is.

Physiology: It is a nerve stimulant; furnishes force, bringing out the potential energies already there, either of the constitution or in food supply; answers well as refreshment for firemen at conflagrations and soldiers on a march. It exhilarates and the drinker feels refreshed. Absorption, governed by the solar plexus of nerves, puts it at once into the blood and it is conveyed over the body with warmth, and by dilution, or evacuation of stomachic and intestinal gases promotes the welfare. Hot water also does this; but coffee does add something, specially if the volatile oil is there to give an appetizing odor that is most grateful to the thirsty and tired recipient. Its effects are speedily felt in the brain, which is ready to go ahead just the same as if the stomach had had solid and substantial food. Coffee does certainly bridge or tide over emergencies and is valuable for this; but is not like the New York elevated roads—all bridge.

Disease: Disturbance of nerves in the brain, making it feel as if the system coffeeized was the same as fortified by food; giving head disturbance enough to cause application for medical relief (as above to name no more). It is somewhat anæsthetic, numbing the feelings to cold. In some it causes insomnia; in others the heart to beat more or less violently and altering the heart sounds. The statements made by manufacturers of substitute coffee are that the genuine is a dangerous food; allowance must be made for the pecuniary interest in the matter. There is no reason why one should not roast and grind their own wheat and barley coffee and save their money for other uses.

Relation to sugar and liver: The sugar should be charged with the liver disturbances and not the coffee. (*See* Sugar.) Those sick of chronic ills, who have to deny their appetites, experience a conversion of taste easily. It is also often seen amongst the moderately well, who, finding they use too much sugar, stop it in the coffee, and soon like the sugarless more than the sugared.

Milk and coffee: For the well, milk is harmless, though there may be something about the drinker that prevents (idiosyncrasy); but for most of the sick, milk clogs the liver and produces biliousness. There is a good deal of sugar in milk, also fat. There are fatty epithelia cells in the liver, so that using milk may be like carrying coals to Newcastle. (*See* Milk.)

The best ways to make coffee: Have it pure, burnt, and ground while hot and immediately put in air-tight receptacles which are common in kitchens; then having coffee pot hot, prepare it on the table by pouring hot scalding water on to the coffee in a bag. We know of no substance in the materia medica that will make more quickly an infusion or tincture than coffee by this mode of displacement. A simpler method is by using a common pitcher and spreading a cheese cloth bag over the top. The decoction of coffee made by simple contact with the boiling water at the bottom of pot results in boiling the volatile oil (which is the delight of coffee), and leaves an infusion of tannic acid that blackens the coffee like ink if boiled too long.

Metal coffee pots would never leak but from the dissolving of the solder and the tin and iron in common coffee pots; thus the metals of the pot have gone into the drinkers, which could be avoided by using crockery pots or pitchers.

Bone, teeth, hair and nails: Has not elements enough to make such.

Mental kingdom: Not as a builder, but rather as a nerve tonic and stimulant. No doubt when nerve force is potentially present, coffee brings it out; therefore useful as whip. But if no nerve force, no response.

Coffee tasting and coffee brokers: One we know of had to give it up, as he showed evidence of nervous prostration.

Those who doubt the effects of coffee should leave it alone and try hot water instead, whose nerve power is shown in its action on the human body amply by personal use. People with whom hot water disagrees are rare.

Chemistry: Not so good, as it does not have enough elements to make tissues, and it is doubtful if it is good in heat given powers, for the hot water is responsible for the latter. Its active principle is caffein, much like thein in tea, and both act as medicines for the nerves.

Tannin is not found in raw coffee, according to Payer; but Cheney reports tannin in the roast. *Caffeol:* an oily matter formed in roasted coffee, C8, H16, O2 (Standard Dictionary); its natural percentage in coffee is 6.697 (Payen). *Caffein,* active principle, N4, C8, H10, O2 (Standard Dictionary); this is a large percentage of nitrogen, and coffee may be deemed a nitrogenous food, as the United States Pharmacopœia says "notwithstanding its large proportion of nitrogen, caffein does not putrify, even when its solution is kept for some time in a warm place" (Standard Dictionary). We do not regard nitrogen as a forceless, negative thing, as conventionally taught, so long as dynamite and over five hundred other explosives, as listed in the Standard Dictionary, depend on nitrogen, in themselves or in the air, for their explosive properties. It is possible that nitrogen is supplied in coffee as food; for as affirmed, nitrogen is a potential power as to nerve centers.

The leaves of coffee have been used like tea. Dr. Sternhouse found caffein in larger proportions than in the bean, also caffeic acid (Standard Dictionary). Here is a chance for commerce.

Climate: Coffee has been used from time immemorial in Persia, Arabia and Turkey. In 1317 it went to France and England.

Recapitulation: Coffee will often remove oppression of spirits, antagonize the power of alcohol and opium and act as a cordial. If too much used, causes a depression equal to the proceeding excitement, destroys the gastric tone, producing dyspepsia and neurosis (Standard Dictionary). All the world, excepting Persia, Arabia and Turkey, apparently got on until 1317 without it.

TEA

This is food, because of the large amount of salts and nitrogen in *thein,* which equals caffein, N4, C8, H10, O2.

Mental kingdom, as it affects the nerves.

Good, when used properly.

Chemistry: Thein is its active principle. It has also 17.80 per cent. of tannin, 0.79 per cent. of volatile oil, 0.43 per cent. of thein, 5.56 per cent. of salts.

Tissue builder: Hardly, as it has no elements to make tissues, teeth, hair, etc.

Physiology: Astringent from the tannin, while the theïn, volatile oil and extractives exercise a decided influence on the nerves; the volatile oil with the rest comforts and exhilarates. Used moderately in health it is perfectly harmless.

Disease: Taken long and excessively, it harms the brain and stomach, producing neurosis and dyspepsia; it does not affect the heart as much as coffee; there are great differences in the bad effect of the different varieties; for example, green tea (made so by chemistry) is sometimes so productive of wakefulness and stomach distress that some cannot use it; black tea comes next, while English breakfast and Ceylon tea produce practically no ill effects. It is said that the best teas are kept in China, Japan and Ceylon, and that the great mass of Americans do not know what good tea is.

Tannin injurious: Not necessarily, as tannin and animal tissues agree and combine together to make a very lasting compound as leather; probably no organic chemical substance is more extensively and harmlessly used in connection with tissues than tannin. It is not a poison, and the only inconvenience from excessive doses is obstinate constipation from arrested downward peristalsis. We have heard of a stomach being tanned by tea topers, but it has not been proved. The skin has been seen to undergo a sort of tanning from outward application of tannin, but the live stomach has not furnished this evidence. To show how tannin agrees with the tissues, it may be said that it has been injected into the sacs of ruptures, narrowing the ring of outlet by making bunches that gave no pain or trouble, and serving as plugs to prevent successful rupture. But people would be better off not to drink astringents against the warning of the palate and at the demand of an abnormal appetite.

Sole food: Not known.

Sugar and milk are much used in tea, but tea does not clog the liver and put bile into the urine as coffee, sugar and milk do.

Seriously sick people on diet may use tea, if they get the right kind and leave out the sugar and milk.

Head: Better than coffee.

Heart: Does not stimulate like coffee.

Heat: Hard to say, as hot water is in large excess in it.

Climate: Used in all climates and universally by civilized man who can get it.

Digestible: When used with common sense.

Condition of consumers: It varies. Some cannot take it. Man can get along without it.

Force: Yes, from the four equivalents of nitrogen in *thein* and the mineral salts of phosphates.

Tea leaves have been eaten like cabbage leaves or celery, only by mistake.

The best way to make tea: That used in Vienna with the Russian Caravan tea: a good sized teapot (crockery fortunately always used on account of tannin) is heated by hot water, which is then poured off; a teaspoon or tablespoon full of said tea put into the pot, which is filled with boiling water, allowed to steep for a short time and then brought on the table. Caravan tea keeps its properties better than tea by ship.

COCOA OR CHOCOLATE

These can be used as a substitute for coffee and tea and differ from the latter in the presence of fat acids and cocoa butter. The active principle is theobromine, said to contain a larger quantity of nitrogen than caffein. Unsuitable for those ill in fatty degeneration, and in such cases the shells of the chocolate nuts may be used. Were it not for the fat and use in milk, the excess of nitrogen would make such better than coffee. In the treatment of disease have caused albuminuria.

Chocolate is made from the roasted and ground large nutritive seeds of theobroma cocoa, of the cola nut family Sterculiaceæ, in the form of a paste or cake mixed with sugar and some flavoring ingredients. Here it also means *the beverage made from the cake with boiling water or milk.* The chocolate nuts are an American tropical product, and said to have come from Mexico.

Shells is the beverage made from the shells of the chocolate nut.

Cocoa is the beverage made from the dried and powdered seed kernels of the cocoa tree, which by the removal of a part of the cocoa butter is rendered more digestible than chocolate.

Broma is the beverage made of the dry cocoa seeds, from which the oil has been expressed.

Good: When properly used.

Bad: Because of the large amount of fat acids, commonly known as cocoa butter, which does not agree with those afflicted with fatty ills of any kind; with this exception, the chocolate preparations are not so deleterious as coffee or tea, when abused.

Condition of feeders: Should be well and hearty, though some convalescents and valetudinarians use chocolate, specially the shells and broma, with advantage.

Morphology: The grounds of a cup of chocolate show much oil, some starch and shapeless masses of substance, which give with iodin the reaction of starch and polarize light; the little milk present does not account for the large amount of free oil.

Chemistry: United States Government analyses: *Choco-*

late, water 10.3, protein 12.5, fat 47.1, carbohydrates 26.8, ash 3.3, heat units 2720. *Cocoa,* water 4.6, protein 21.6, fat 28.9, carbohydrates 37.7, ash 7.2, heat units 2320. Wood and Bache state that the chocolate nuts contain albumin, bitter extractive and a large quantity of fixed oil called cocoa butter. Brands calls the oil, cocin and acid, cocinic acid, since found to be made up of caproic, coprylic and pichuric acid. Workesenky found in the seeds, theobromin, allied to caffein; formula C7, H8, N4, O2, which gives a larger per cent. of nitrogen than is found in caffein or thein.

Physiology: Chocolate is a mild, unctuous, demulcent agreeable tonic to the stomach and is considered nutritious where fats do not disagree.

Disease: Its fats help the diseases of fatty degeneration in their pre- and established stages. Otherwise we find nothing. Does not cause insomnia, like tea or coffee.

Sole food: Probably only a short time.

Cures: Used for dyspepsia and as a substitute for coffee in mild acute disease and in chronic ills uncomplicated with fatty degeneration.

Head: The capric, caprylic and caproic fat acids, also found in butter, which is, other things being equal, a good head food, make the chocolate seeds take a like place. The theobromin with its large per cent. of nitrogen is another good qualification. These, added to the fact that it does not cause insomnia, commend chocolate for head work; if the taker is tending to, or in, fatty degeneration, then broma.

Heart and muscles: Save the oil, nitrogen makes chocolate a good muscle food.

Bones, eyes, hair and teeth: The mineral matters in chocolate commend it sugarless for these.

Intestines: Parr says that if chocolate is uneasy to the stomach a cup of cold water drank will afford relief. But the intestines are not much disturbed by chocolate as a rule. Its astringence helps to sweeten the bowels.

Heat units: 2320. These come from the fats and carbohydrates in such excess; few foods have a higher heat ratio. And yet it does not warm more than coffee or hot water.

Force: The large amount of nitrogen should make chocolate a dynamic food; but in use coffee has the preference. This may be habit.

Climate: Belongs to the tropics and used in all climes.

Medical: Here the interference of custom to remove the fats in a measure is beneficial, as the excess of fat makes it more difficult to digest.

Fashionable: Specially in candy, where it is combined with an excess of sugar.

Builder of tissues: To a certain extent; the fat in moderation goes to supply normal fat, and the ash, mineral elements.

Skin: Cocoa butter is a most excellent emollient; its flavor is agreeable; it dissolves at body temperature, does not grease the clothes; affords great relief to such eruptive diseases as scarlet fever and helps to protect the internal organs from the setting in of the eruptions.

Fermentation: Does not rapidly, because of the fat and oil and the large amount of the mineral salts.

Parasites: We find none.

Intemperance: Not much, except in the form of candy, and in this considerable.

Preparation of chocolate: In the United States and Great Britain, generally when pure, the nuts alone are roasted, deprived of their shell, ground between heated stones to a paste and moulded into oblong cakes. Rice and other flours, butter and lard are used sometimes to adulterate. In Europe, sugar, spices, cinnamon are usually incorporated.

Vanilla is also used in France, Spain and South America; Spain also adds cloves and capsicum. In Mexico, chocolate is mixed with indian corn, a few seeds of rocon and a little vermilion.

Vegetable Kingdom Foods Analyses; 1,000 Parts Fresh or Air-Dry Substances; From "How Crops Grow," 1905. According to Prof. E. von Wolff, 1889.

	Water	Nitrogen	Ash	Potassium	Sodium	Calcium	Magnesia	Phosphoric Acid	Sulphuric Acid	Silicta	Chlorine
Apple, entire fruit	831	0.6	2.2	0.8	0.6	0.1	0.2	0.3	0.1	0.1	
Asparagus Sprouts	933	3.2	5.0	1.2	0.9	0.6	0.2	0.9	0.3	0.5	0.3
Spring Barley	143	16.0	22.3	4.7	0.5	0.6	2.0	7.8	0.4	5.8	0.2
Winter Barley	145	16.0	17.0	2.8	0.7	0.1	2.1	5.6	0.5	4.9	
Garden Bean	150	39.0	27.4	12.1	0.4	1.5	2.1	9.7	1.1	0.2	0.3
Beets	880	1.8	9.1	4.8	1.5	0.3	0.4	0.8	0.3	0.2	0.9
Cabbage Heart	900	3.0	9.6	4.3	0.8	1.2	0.4	1.1	1.3	0.1	0.5
Cabbage Loose Outer Leaves	890	2.4	15.6	5.8	1.5	2.8	0.6	1.4	2.4	0.1	1.3
Carrots	850	2.2	8.2	3.0	1.7	0.9	0.4	1.1	0.5	0.2	0.4
Cauliflower Heart	904	4.0	8.0	3.6	0.5	0.5	0.3	1.6	1.0	0.3	0.3
Cherry, entire fruit	825		3.9	2.0	0.1	0.3	0.2	0.6	0.2	0.4	0.1
Cucumber Fruit	956	1.6	5.8	2.4	0.6	0.4	0.2	1.2	0.4	0.5	0.4
Grape, entire fruit	830	1.7	8.8	5.0	0.1	1.0	0.4	1.4	0.5	0.3	0.1
Horseradish	767	4.3	19.7	7.7	0.4	2.0	0.4	2.0	4.9	1.5	0.3
Lettuce	940		8.1	3.7	0.8	0.5	0.2	0.7	0.3	1.3	0.4
Maize	144	16.0	12.4	3.7	0.1	0.3	1.9	5.7	0.1	0.3	0.2
Mushrooms, Edible	888	4.7	10.0	5.1	0.2	0.1	0.3	3.4	0.4	0.1	0.1
Mustard Seed	130		36.5	5.9	2.0	7.0	3.7	14.6	1.8	0.9	0.2
Oats	143	17.6	26.7	4.8	0.4	1.0	1.9	6.8	0.5	10.5	0.3
Onion	860	2.7	7.4	2.5	0.2	1.6	0.3	1.3	0.4	0.7	0.2
Parsnip	793	5.4	10.0	5.4	0.2	1.1	0.6	1.9	0.5	0.2	0.4
Pea	143	35.8	23.4	10.1	0.2	1.1	1.9	8.4	0.8	0.2	0.4
Pear, entire fruit	831	0.6	3.3	1.8	0.3	0.3	0.2	0.5	0.2	0.1	
Plum, entire fruit	838		2.9	1.7		0.3	0.2	0.4	0.1	0.1	
Potato	750	3.4	9.5	5.8	0.3	0.3	0.5	1.6	0.6	0.2	0.3
Radish	933	1.9	4.9	1.6	1.0	0.7	0.2	0.5	0.3		0.5
Rutabagas	870	2.1	7.5	3.5	0.4	0.9	0.3	1.1	0.7	0.1	0.5
Spring Rye	143		18.0	6.2	0.3		2.2	9.2		0.2	
Winter Rye	143	17.6	17.9	5.8	0.3	0.5	2.0	8.5	0.2	0.3	0.1
Spinach	903	4.9	16.0	2.7	5.7	1.9	1.0	1.6	1.1	0.7	1.0
Turnips	920	1.8	6.4	2.9	0.6	0.7	0.2	0.8	0.7	0.1	0.3
Spring Wheat	143	20.5	18.3	5.6	0.3	0.5	2.2	9.0	0.2	0.3	0.1
Winter Wheat	144	20.8	16.8	5.2	0.3	0.5	2.0	7.9	0.1	0.3	0.1

CANE SUGAR

Is it food? Usage and chemical composition (C12, H22, O11) make it so.

Kinds of sugar (Standard Dictionary).

Name and Group:	*Source and other name:*
1. Arabinose.	Gum Arabic.
2. Dambose.	Dambonite, gaboon India rubber.
3. Dextrose, glucose and grape sugar.	Vegetables, honey.
4. Eucalyn.	Melitose, manna gum tree.
5. Galactose.	Milk sugar.
6. Inosite.	Flesh, heart muscle sugar.
7. Lactose.	Milk sugar.
8. Levulose.	Fruit sugar.
9. Maltose.	Malt sugar.
10. Meligitose.	Larch manna.
11. Melitose.	Australian manna.
12. Mycose.	Fungi as of ergot sugar.
13. Saccharose, sucrose.	Sugar cane, beet, etc.
14. Scyllite.	Fish, etc.
15. Sorbin.	Mountain ash berries.
16. Synanthrose.	Dahlia and other tubers.
17. Trehalose.	Trehala manna.

Saccharose group: 7, 9, 10, 11, 13, 16, 17; *Glucose group:* 1, 2, 3, 4, 5, 6, 8, 14, 15; *Unclassed:* 12.

Saccharose: Any one of the sweet group of carbohydrates, including the above, viz., C12, H22, O11, polarizing light to the right.

Glucose: Sweets with the formula C6, H12, O6, regarded as aldehydes of saturated alcohol, C6, H14, O6.

Aldehydes: Ethylic alcohol dehydrogenized.

Ethylic alcohol: Alcohol from grain, maize, etc., and the hydrated oxide of ethyl, $C2, H5, OH$.

Ether: Oxide of ethyl; $C2, H5, O$.

Ethyl: A monatomic uninsulated organic radical of the paraffine ($C2, H5$) series.

What does this chemical nomenclature show? That sugars are related closely to alcohol, paraffin and fats, also carbohydrates.

Glucose in man: Found in the blood, liver (the liver is a sugar making organ) and urine; but abnormal when present in the last named, producing the disease diabetes mellitus.

Sugars found in the human organism normally: Glucose, inosite, lactose.

Sugar is then a collective term for substances found in the animal and vegetable kingdoms.

Mineral: No, unless you call carbohydrates mineral.

Organic: As it burns and is found only in organisms.

Beautiful: In the highest degree, as man is pleased with the palatal beauties of sugar, specially the saccharose or cane sugar, because it is sweeter than grape sugar or glucose.

Fashionable: In banquets intended to display all the art of the caterer in every direction, sugar and its preparations make the chief pieces of resistance.

Does it make tissues? No. These three elements cannot make fifteen or more found in the normal tissues of man, no matter how good their combinations may taste.

Physiology: It is digestible in normal amounts because soluble. Its use is to furnish heat, its calories being very many; when taken as saccharose, the liver changes it into glucose, then it is burnt up in the lungs; it is *thought* by some to give force, and it is said that (1900) the British and German army have been furnished with a sugar ration as an emergency food. Chemists endorse sugar as a physiological food and also the French nation, who say that all food that tastes good (sweet) and looks good is a good food. The senior writer did not find it so in Paris in 1889 and ate with children in order to get rid of the artistic productions of the French cuisine. Parents sometimes feed children on candy until it is loathed to cure them of the habit. "Hast thou found honey, eat so much as is sufficient for thee lest thou be filled therewith and vomited."

Force: According to the above authorities it furnishes some, but not according to our experience and that of others; in 1900 we find that the United States soldiers in the tropics are fed with beef, rather than with sugar. (*See* Beef—Climate.)

Climate: It is used in all climates when it can be had, more in the tropics than elsewhere.

Children's food: Decidedly, but wrongly, according to custom and inclination; the youngest babe likes sugar. Confectioners thrive on children's love of sugar; but we have known a six-months-old babe who ate a lemon with as much avidity as any babe ever ate sugar.

Candy: An allotropic form of sugar. It is like wrought iron as compared with cast iron. Sugar is commonly in crystals; in candy the crystals have been drawn into fibres as in puddling ore, but chemically candy is sugar.*

Sole food: We know not, but wish some of its advocates would try it. It is almost always used as a multiple food, and it would seem as if the art of cookery and confectionery was more prolific in the combinations of sugar with other things than any other article of food save water. People, not cooks, sugar food of many kinds; even vinegar pickles

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* A patient in tuberculosis who, told not to eat sugar, was accused of doing it because the consumptive morphologies of blood and sputum showed a return when they had begun to depart; she denied it but said she had eaten candy, *not knowing it was sugar.*

may be often sweetened. That the natural taste of food should be mingled with sugar is a question.

Glucose is made in the mouth from starchy foods acted on by the juices from the salivary glands.

Proper cooking changes starch into sugar: A down town restaurant (Smith & McNell's) has furnished to its guests examples. This is the *ne plus ultra* of cookery, but it is not always done, and, as said before, the liver and pancreatic and salivary secretions have to do this.

Yeast changes starch into sugar: Here is the advantage of leavened bread over unleavened—easier to digest. More of this in bread.

Brain food: We think not beyond the heat furnished.

Heart: Not good.

Hair, nails, teeth, bone: As it has no fluorine, lime nor other mineral elements from which such are made, sugar is not sufficient.

Cure: It is used very extensively as a vehicle for medicines, also to disguise the taste of medicines; but we are not aware of its being used as a medicine alone.

Common white sugar, when pure (as it generally is), is, judging by the eye, a good food. The unclarified sugar, however, is better, because it has in it more elements; the old-time sugar planters preferred brown sugar; there is an aroma and bouquet to it not found in white sugar; so also maple sugar unclarified is much preferred to white maple sugar.

Molasses: This is the uncrystallizable mother liquor of sugar cane juice, or ought to be as in the old-fashioned molasses. It is said new processes are now used and a good deal of molasses is but a fluid extract. Other things being equal, molasses is preferred to syrup of white sugar as food on chemical grounds only.

Condition of eater: No doubt some can take it better than others, and there are very few civilized people who do not use it in some way or other.

Mental kingdom: A poor food chemically, it cannot be of mental uplift.

Cause of disease: Sugar is specially prone to fermentation, hence *see* chapter on same.

WHEAT

Is the most universally used vegetable food; 1749 B.C., the "time of wheat harvest," is spoken of as a measure of indefinite duration; it has held its supremacy as the king of grains. Few civilized humans have not eaten wheat.

Organic because it burns and it is an organ from an organism of the vegetable kingdom, though popularly it is not a "vegetable;" it is not in the animal or mineral kingdoms; mineral substances are found in wheat, but they do not place wheat in the mineral kingdom because of its botanic life.

Spiritual kingdom: Wheat bread is the "staff of life" in its completeness and fullness of perfection that imply the existence of mind, intellect and soul.

Good or bad: Used rightly, good; used wrongly, bad; this covering environment and deterioration.

Condition of eaters: We know of no vegetable that agrees as a food and not as a relish (as celery) with more human beings than wheat. It is barred by no religious ban; it agrees with peoples of every clime.

Part used as food: The grain.

Morphology: It is made with all the glory of architecture, solid geometry and structural details. The tegumental protection is more elaborate than the roofing of a house or the hulling of a ship or the environments of man's preserved foods. The substance (parenchyma) of the wheat grain is made up of starch grains and gluten granules arranged in solid cells of connective tissue, closely bound together and yet fitting each other by flat surfaces, making the cells appear rhomboidal, angular, symmetrical, as if they were laid down in accord with a previously drawn architectural plan of the greatest skill, showing evidence of the highest mechanical genius; because of this anatomy it will keep indefinitely, away from moisture.

This admirable anatomy hinders digestion. We cannot use wheat as the Roman soldier did in Cæsar's army and eating when on the march, because such requires good teeth. and time that modern society does not have to spare. (The habit would be good to use, as long chewing starts the salivary glands to secrete juices that even in the mouth change the starch into glucose; digestion is helped and a load taken off the bowels and liver.)

Chemistry: (*See* table, p. 124.)

Physiology: It contains every element necessary for man in the proportions intended and is the most biologically perfect food of the vegetable kingdom.

Head: The large amount of phosphoric acid in whole wheat renders it especially fit to replace the triple phosphates usually found in excess in the urine after considerable mental exercise. Indeed, wheat being the vegetable food on which man can live the longest in health, proves this enough for our purpose here.

Heart: The heart shows no weakness on a whole wheat diet. Its phosphorus and nitrogen feed the heart nerve ganglionic centers that make it an autonomy to cardiate for our lives; for, unless actuated by its governor (ganglionic) to beat faster when more work is suddenly put upon it, "the wheel would be broken at the cistern" oftener than it is.

Bone, teeth, nails and hair: Admirable because of so much mineral food in soluble form.

Eyes: Contain mineral matter; the cornea and the crystalline lens are not made of carbohydrates alone, and hence may be considered akin to bone, teeth, nails and hair. The soluble minerals of wheat are needed for their construction and nutrition.

Force: Whole wheat is an example of the kinetic potential energy stored up in a most admirable and wonderful manner for its actual energy to be exhibited in man who eats it; a marvelous example of the conservation of energy displayed ninety-three million miles away. (It is wonderful how *white flour* has such a hold on poor people. A poor man once said, "Doctor, you will never get my people to use wheat meal or whole wheat flour; they think they are good enough to have the best flour with the rich and would feel themselves degraded to eat the dark." And this, notwithstanding that a cup of cleaned whole wheat with three cups of water, boiled in a water bath for five hours or until it shows a reaction of glucose is food enough for a family of four to six, costing for wheat say two cents; "surely the destruction of the poor is their own poverty" of common sense.) The gluten of wheat contains nitrogen; the more gluten cells removed in the milling, then the less nitrogen and the less dynamis. In view of the most universal use of wheat preparations by man the question of dynamis is vital and comes to every human being of the dominant races.

Heat units: The animal heat is well kept up by it in the normal nourishment.

Climate: Found in all. It follows civilized man into every clime though not a tropical product.

Customs: Wheat finds a place in ethics where it is obtainable. If the savage does not eat it, it is because he cannot get it. (Our Indians eat *white flour* when it is to be had and some with disaster, dying of consumption.)

Blood, skin, muscle and kidney food: It has fully met the requirements, but not in chronic diseases, though it is the first vegetable food to be offered to the ill save the relishes.

Sole solid food: Forty-five days is the longest time known where wheat has been lived on by Americans, including coffee, without physical damage. Here is its indisputable preeminence at present. It is possible that dates may contest this.

Parasites: Flies lay their eggs in wheat meal, and entire wheat flour sours from fermentative vegetations and moisture, but common sense and care will avoid these. As water is made less noxious by boiling, so is wheat by cooking at the much higher temperature of 275 to 300 degrees Fahr. of baking. Partial list: aphid or louse; beetle; bug; bulb fly, meromyza; bulb worm, anthomyid; maggot and caterpillar; chafer; cut worm; eel worm; gall fly; midge; mildew; mite; moth; pest; plant louse; smut.

Religion: It is considered a clean food by all religions. No one in India breaks caste by eating wheat.

Alimentary canal and fermentation: Not if properly cooked, chewed and the eater's digestive organs are in good order. Whole wheat much chewed and (better) whole wheat well cooked are especially good in the cure of constipation. (*See* Fermentation.)

Intemperance: As with anything that is good, the satisfaction of appetite is a test for temperance in eating. Still other things being equal, less harm would be expected from wheat than other foods, as nature would excite vomiting to relieve the overloaded organs. Doubtless this vomiting would be considered a disease by some when in reality it was only an effort to prevent disease, set up by the watchful care of the solar plexus. This government of the state of the stomach by thirst, by the sense of overloading and by vomiting, is one of the acts of the involuntary nerves.

Bread: Is the most common form of wheat eaten.

Kinds of bread: Unleavened and leavened. Unleavened *whole wheat bread* is the baked result of true Graham flour, wheat meal or entire wheat flour, mixed with water and air into dough. After it comes from the oven it is called "gems." *Leavened* bread is the same with the addition of yeast.

Object of bread: A more digestible food of wheat. *In unleavened bread* the whole wheat flour mixed with salt and water incorporates air bubbles into its substance of sticky gluten filled in with starch. In baking it is subjected to a heat of 275 to 300 degrees Fahrenheit, which goes through the substance of the loaf; the water is expanded into steam, which causes the bread to rise in caverns of varying sizes according to the kneading of the dough; this vesiculation gives more surface for heat to act on and partially turns the starch into dextrin, as it does in the crust which is more soluble than starch. *In leavening bread* the process is the same as in the unleavened, adding alcohol, carbonic acid gas, succinic acid, more water, etc., and changing the starch partly into glucose; at 300 degrees Fahrenheit the alcohol and carbonic acid gas are evaporated and help the vesiculation very much in their dissipation. Cooks desire in bread that it be well raised into a fine sponge, where the cavities are very small, uniform and even, thus making it look puffy to catch the eye and later the palate. Leavened bread is more desirable than unleavened, as it is more digestible, the glucose formation being well begun. Whole wheat flour requires less yeast, one-quarter of a yeast cake being ample when dough is raised over night for a small family, one cake being needed for the same quantity of ordinary flour; or if the quick process is used in bread making, a whole cake is needed. It is probable that the excess of yeast in ordinary whole wheat bread making has interfered with its introduction, as there has been souring of the bread.

Souring is due to the formation of vinegar yeast; always alcohol yeast, kept growing to a certain point, is followed by vinegar as shadows follow man in the sunlight; vinegar is sour (the word means sour wine), and is injurious in bread and the bane of the intestinal fermentations (*see* Fermentation), hence all cooks try to prevent it, which is best done by baking the dough before it has formed. Some bakers prevent it by adding carbonate of soda or ammonia to the dough, which is not a good plan, as the acetate of soda remains; wheat containing the right proportion of minerals already, the adding of another salt to this is not good biology.

Mushes: Whole wheat ground, crushed or rolled, cooked with water three or four parts to one part, in a water bath five or more hours until done. Objection is, there is not chance enough to change the starch into glucose.

Baking powders: As bread is wanted to be puffy, this process can be accelerated by using carbonic acid gas that comes from the carbonate of sodium and tartaric acid, phosphate of lime or alum. They simply puff up the bread and do not change the starch into glucose and add extra salts to the system.

Aerated bread: Air forced into dough under pressure. Baked, the air expands and vesiculates the bread which is a beautifully white product and better than the baking powder product, but because the middle of the loaf showed a dark spot, which came from the morphology of the air, aerated bread went into disuse.

Leavened bread would be unhealthy but for the baking, as 300 degrees Fahrenheit kills the yeast, or at any rate renders it harmless.

Bacilli in bread: Drawings (American) of bread bacilli were in the archives of the Victoria Institute, London, in 1884; heat injures them, but in many instances after baking they were found automobile and active.

The crust of whole wheat bread is nutritious because of its dextrin ($C12, H20, O10$), which is soluble, more digestible, and not so sweet as sugar.

Cakes (flour, eggs, butter and sugar) made from *whole wheat flour* are better than those made from white flour, but not conventionally, as they appear less delicate. They are richer in the mineral salts needed to make tissues and digest better. For example, whole wheat doughnuts act better in delicate stomachs than common flour doughnuts, and as such they have been recommended for healthy people who think sugarless life is not worth living. Also in pie crust, whole wheat meal and flour have been found good, because of the extra chemical elements in the gluten which has been allowed to remain in the flour.

Common flour: Is made up of the body or parenchyma of wheat and does not include the coats, especially the gluten comb coat, hence it is deficient in mineral elements and proteids found in said gluten; and is thus manufactured on the ground of beauty, that requires whiteness as the *sine qua non,* and because the coats are deemed useless and injurious; the milling all runs to this ideal, not that the millers think so, but because people will not buy nor use flour unless it is the color of snow; darker flours are not in fashion, even though you prove them to be better; the millers are to be given great credit, for when in 1884, the attention of the National Association of Millers was drawn to the subject of impoverishment of flour, they voluntarily improved their processes and doubled the amount of mineral elements in without darkening the flour. This is now the standard of white flour. We wish here to thank them for this great gain.

Common flour cake: The excess of sugar and fat substances and the lack of mineral elements form objections to it; the delicateness is more in looks than in reality; a cake is a composite substance, and composite foods are harder to digest than single ones (*see* Fermentation). *Sponge cake* is least hurtful; it is made of eggs, flour and sugar, the fewest materials. *Wedding cake* is especially hard to digest because it is so composite.

Hardtack: Unleavened bread made of common flour without salt, baked and then kiln dried. It is a true biscuit (bis—twice; cuit—baked). Used in the U. S. Army and Navy as ship bread because it keeps so well and for so long a time. U. S. Surgeon A. P. Clarke, now of Cambridge, Mass., said that soldiers in the war of 1861 came across some hardtack that was thirty years old and in good order. This was due to the absence of yeast, which is found in the soft tack. Although the yeast is killed in baking, still leavened bread does not keep like hardtack, as it offers a nest for the vegetations of fermentations very akin to yeast, as it has more water and hence is more susceptible to the germs of yeast found in almost every atmosphere ready to grow on moist soil in the dark. Hardtack of common flour has not stood the test of sole feeding, as the men so fed suffered consequently from acute consumption of the bowels or intestinal tuberculosis. (*See* Fermentation.)

Pies: The so-called and much-berated *mince pie* is really the best, as it is made up of beef with relishes. *Custard pie* comes next so far as nourishment is concerned. Pies, being so composite, are not commended as daily food; but if people will eat such let them choose mince or custard; if the flour is whole wheat, so much the better.

Puddings made from flour: They are a species of cake made of fruits, sweets and crumbs of bread, usually boiled and sometimes baked. They are truly "twice" cooked and therefore come under biscuits. The remarks as to cake will apply to them, only emphasizing that whole wheat meal or flour will remove much of the physiological objection to puddings. They are soft generally and thus do away with chewing; it cannot be too much insisted on that teeth are made to be used properly.

Breakfast foods: Those of wheat are superior to those of oat; objection is made to all preparations that have been malted by mixing with molasses and treating by heat, resulting in too rich malt food.

Infant's foods: The senior writer's paper, Cereal Foods under the Microscope, 1882, demonstrated that certain preparations of this much advertised class were wanting and that there was much to discourage the physician wrestling with the problem of tiding over the difficulties of feeding babes; the process of malting is to-day carried to excess in some preparations, resulting in the production of rickets in the feeder. The chemistry and morphology of these preparations can be sufficiently studied by the physician to enlighten him as to what is before him.

A motherhood diet of whole wheat and meat results in human nursed children who cut their teeth normally and do not have cholera infantum; the eruptive diseases of such children are mild and harmless.

WHITE POTATO

Solanum tuberosum: It is largely used by civilized man; in 1586 A.D. was introduced to England from the Andes in South America; is a tuber or root, composed mainly of starch. Curiously enough, it belongs to the solanum family, in which is the well-known belladonna, so called because atropia, its active principle, dilates the pupils, making the ladies (donna) more beautiful (bella).

Varieties: There are over five hundred, all solanum tuberosum to the botanist, but to the farmer they are early rose, etc.

Vegetable kingdom: Certainly.

Mental kingdom: They are not regarded as intellectual food, par excellence.

Good: When properly used.

Condition of eaters: Not so well borne by the sick. Rarely are they given to patients. (It is curious that people will more willingly give them up than wheat.)

Pathology: Not known. We think no detriment has been traced to potatoes save in the famine in Ireland about fifty years ago, when the Irish lived on potatoes with disastrous effects, among which typhus fever was prominent; but in this case the potatoes were rotten and were all the food to be had. Under such circumstances typhus would be expected, as it is a germ disease, as is also potato rot.

Chemistry: They are mostly starch. The mineral elements are not so large as in wheat (*see* table p. 124.)

Structure: They are compact, but nothing like wheat. Boiling, steaming, baking brings on rapid and great changes, that prepare them for digestion. A section of raw potato shows a network whose meshes are filled with starch grains. Boil, steam or bake potatoes and the starch grains are found enclosed in sacs of glassy cellulose so thick that if a sac could be magnified to the length of two inches its coat would be one-quarter of an inch thick. The starch grains in perfect cooking are reduced to a uniform homogeneous mass that does not polarize light; if not thoroughly cooked, the starch grains preserve their shape, more or less, and more or less polarize light, so that polarized light and changes of form are tests of potato cooking; the connective fibrous tissues of the potato are not very strong, and hence potatoes are easily cooked; the mealy condition of the potato is due to the separation of the network of cellulose into said sacs, which are of many other shapes besides of the egg. In Smith and McNell's restaurant potatoes are turned into glucose by cooking.

Sole solid food: Probably not over a month.

Multiple food: Almost always. Meats are always used with potatoes, which are deemed ethically to be the chief vegetable food (but which wheat is). However, it is not compounded with other foods as wheat is, nor do people use free sugar on potatoes as on cereals. They are not used in cakes or pies nor puddings to any extent.

Best cooking: Steaming or baking, as thus the soluble mineral salts are not soaked away, nor are they sodden or heavy as often in boiling, hence are not so indigestible; the aim in cooking potatoes is the change of starch into glucose and to soften their substance.

Raw fried potatoes: When fried (not immersed in a bath of boiling fat), very briefly, only enough to turn the cell water of the potato into steam and thus change the starch into glucose, and having only butter or fat enough to keep the cuttings from adhering to the pan, they are healthful; the whole nutritive and palatal virtue of the potato appears to be utilized like the potato baked in the embers of a forest fire in the spring. *Saratoga chips:* Good, if not overcooked into dry, indigestible matter. *French fried:* They very often agree with delicate digestive organs. *Mashed:* These are boiled; mashing improves them, but does not make them digestible unless they are changed into glucose. *Boiled:* They should, but rarely do, come up to the glucose standard (as above), when their taste is pleasant and their substance dissolves readily on the tongue and hard palate and act well in the stomach; too often they are sodden, heavy, tasteless, and give no reaction of glucose. *Biscuit potatoes:* Twice cooked by boiling, slicing cold, and cooking once more; this carefully done, they are more digestible and appetizing; it is a process to be commended, when the first cooking is not satisfactory; indeed, this is a rule for many cooked articles of food. There is danger of carrying this too far and over-cooking, and then you are as bad off as before. *Potato bread:* Is not bad, but not desirable, as there is no gluten in potatoes to vesiculate into sponge and crumbs.

Head: Fair. *Heart:* Baked and raw fried potatoes are "hearty" food. *Eyes:* Fair; there is too much starch to be changed into glucose to make them good eye food. *Bone, teeth, nails and hair:* Far better than common flour.

How often used: Generally at the midday or evening meal by the mass of mankind, and always in combination.

Heat: The starch alone makes this.

Force: Not so much as in whole wheat and dates.*

Climate: The natural potato range is in the Andes, from Chili to Colombia and north to New Mexico; it is cultivated in all the United States, including Alaska and the Canadas. It cannot be regarded other than a universal civilized human food with a fine reputation and character. It fits into the customs of many races and peoples.

Fashionable and aesthetic: It has not been injured by fashion like wheat. This is probably because the starchy parenchyma or substance is white colored enough to meet the behest that starch food should be white.

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* There is a Revolutionary story told of a flag of truce between Gen. Marion and the British in South Carolina. During the conference, the British officers were invited to dine on baked sweet potatoes and drinks; the plainness of the feast amazed the guests and they wondered how they could fight on such rations; yet the potato fed soldiers conquered. There must have been some force to potatoes to vanquish foes who had a so-called more liberal diet (and it may be said that less force was expended in digestion of a single food) and of course there was more force to expend in fighting. And then Gen. Marion's men had food for their spirits in the fact that they were fighting for liberty, while their foes were fighting for wages.

Religion: Not under the ban.

Builders of tissue: Better than common flour, though not equal to whole wheat, milk or beef.

Skin: Never have known it to cause skin diseases, which are, nine cases out of ten, expressions of poor feeding or exhausted force. The germs of skin diseases may lurk latent in the blood, ready to prey when the vital resistance is lowered below par. As jockeys make one test of the health of the horses by the skin, so may we of the health in man. A hard, tight, erupted skin in man or cattle is not a sign of health, and when people walk in with the flags flying of irritated, inflamed skin, one may be sure there is disease present, but not brought on by potato feeding.

Alimentary canal: If properly cooked (that is, if their starch is changed into glucose before eating) do not ferment; the morphology of the bowel discharges for years has shown that the ordinarily cooked potato does not digest; their sacs of starch run the gauntlet of digestion unchanged save by the alcohol and vinegary fermentations vegetations. To be sure the first action of intestinal alcoholic yeast is in the right direction, to wit, solubility of the starch; but the vinegar and carbonic acid gases undo all this good work and cause catarrh of the bowels. The absence of yeast from the potato is advantageous. With the precaution of proper cooking we think that potatoes might be given the sick as *sole* vegetable food oftener than they are to advantage.

Potatoes ferment into glucose, alcohol, carbonic acid gas, succinic acid, water. Alcohol is made from potatoes in mash tubs and stills; sometimes the alimentary tract becomes a brewery from potato fermentation, but not so often as with other vegetable foods. (*See*, Fermentation.)

Parasites: Not many save the rot. This is very visible from its black color (due to bacteria and mycelia of the fungus) and bitter to the taste. The admirable potato skin keeps off most infections; even when the potato is wounded and its skin removed, nature protects by hardening, thickening and blackening the denuded parts on a par with the marvellous process that heals a human skin wound; indeed, the potato seems as instinct with life saving skin processes as man's.

Intemperance: Not much.

The "potato bug" diminishes the supply, and, unchecked, would make a potato famine and ruin the farmers. This beetle is only a phase of the battle for life that is going on everywhere on land and sea. Parasites are very much in evidence in all biology. Potato beetle, doryphora decem-lineata; beetle; lema trilineata; blight or rot; eel; fly or blister beetle; fly, another meloid; rot, phytophthora infestans; weevil, trichobaris trinotatus; worm and tomato down larva, the potato contends with.

RICE

A grass, the staple food of India, China and the Indian Archipelago and eaten by more human beings than any other cereal. The best quality is produced in South Carolina and Georgia, brought there in 1693 from Madagascar.

Vegetable kingdom: Yes.

Mental kingdom: The food for so many races which, taken as a whole, do not manifest intellectual supremacy to those races who eat wheat and animal foods, it cannot be called the best mental or spiritual food.

Good: Yes. *Bad* when not normal or properly prepared in culture, keeping and cooking.

Condition of feeders: Seems best suited to colored savagery, the tropics and Oriental religions.

Physiology: Rice maintains all the systemic functions of said races, but not at the highest standard.

Pathology: Rice does not confer the resistance to disease as other diet. For example, the recent plague in India ravaged the native eaters of rice, when Europeans, not exclusive rice eaters, escaped. Leprosy is common in rice-eating countries; in America it is exceptional.* Elephantiasis is also an Asiatic disease. It is very much with disease as water environs a ship; if there are any leaks, the water or disease will get in. A tight, whole or healthy ship or body will not leak.

Directly, it does not confer disease unless improperly cooked. The senior writer, with his wife, once visited an eminent medical man and was given a rice soup in which the grains were contracted, hard, dark and difficult to chew. This gentleman died not very long afterwards and such food must have injured him. Rice has everywhere the reputation of a wholesome food.

Chemistry: Four analysts give albumenoids 5.9 to 7.8, starch 73.9 to 79.9, gum and sugar 1.6 to 2.3, fat 0.1 to 0.9, ash 0.3 to 0.9, water 9.8 to 14.6 (How Crops Grow). It has not been chemically and mechanically deteriorated as wheat has been at the behest of eye æsthetics.

Morphology: Rice grains are hard, almost glass like, oblong, pointed at one end. It has no germ like wheat; the starch is very small, rhomboidal, with angles so that the fit of the grain is a splendid specimen of solid geometry. The

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* Beri-Beri from Rice Eating.—Baron Sancyoski, the Director-General of the Medical Department of the Japanese navy, published in the Sei-i-Kwai *Medical Journal,* for April and May, 1901, interesting statistics in relation to the prevalence of beri-beri in the Japanese army and navy between the years 1884-1885: The conclusions arrived at are: That in the east the rice eaters are the only persons affected by the disease; that its extirpation from the army and navy of Japan is due solely to improvement in diet; that rice eaters transmit beri-beri to localities where it did not exist before their arrival, and that it is inseparably connected with rice, and is caused by lack of nutrition. It is more apt to occur among communities which are supplied by "white Chinese rice" than among those which live upon "red Chinese rice." This last yields, upon analysis, a larger quantity of fat and albumin.—*American Medicine,* Jan. 6, 1902.

outside coat is easily removed, and is, if anything, more silicious than wheat; it grits in the teeth like the silicious walls of equisetum; its structure reminds one of dentine and is harder than the chitinous end of grains of corn, etc. The best cooking (Japanese) of rice leaves the grain separate and non-adhesive; the American cooking makes the grain soft, sodden, sticky, the longitudinal grain laid open laterally and generally with a concavity opposite the groove or hilus. (A late naval surgeon, Dr. Coues, who had large experience in Asiatic waters, wholly condemns the American rice cooking, and praises the Oriental; his opinion deserves consideration, as the best means of cuisine should be employed.) There is an absence in rice of the abundant connective fibrous tissues found in wheat and potatoes. A morphological study of rice grains (commercial) shows the substance to be of a pure white, consolidated into glass-like continuous tissue masses, which in cross section (an irregular oval) are in thirds with a deep line of demarcation corresponding with the faint longitudinal furrows; under polarized light the starch grains, which were about 1-6000 inch in diameter, did not respond. This showed they were cooked, probably in a kiln; further proved by the Fehling copper test. The almost entire absence of connective tissue was very apparent. Altogether the anatomy of rice is very unique and wonderful.

Sole food: A large portion of the human race use it as an almost sole food, and it must be said that rice can be lived on indefinitely or that more races live on it than any other cereal, but special experiments with Americans have shown that rice can be lived on safely for forty days.

Multiple food: Among Europeans and western races it is usually a dessert in the form of puddings and rarely eaten alone, but on the other hand it enters like wheat flour into composite foods like cake and pies.

Cures: It will act well in weak stomachs, because it is digestible when properly cooked.

Brain: Not equal to wheat.

Heart: It is not hearty, at least it does not figure as such, though it does give strong hearts to the porters in India who are said to carry such enormous loads, and to the jinriksha men in Japan, who run with their little carriages sixty miles a day. Rice, therefore, must be conceded to be a good heart food, after the system has gotten thoroughly accustomed to it, so as to assimilate all its nourishment possible. (But the paragraph on Pathology shows the awakening of Japanese authorities to the greater value of other foods than rice.)

Eyes: Experiments are needed to determine.

Bone, teeth, muscle, nails, hair: Rice is a good food for such.

How often used: Daily without much variety.

Heat: Abundant, as it has plenty of starch.

Force: Accounts vary; it must confer actual strength and energy to do work which in the warm countries is not to be compared in amount to the work of men in temperate climates; the Orients eat rice because they cannot get anything else to eat. It is safe to say that rice eaters have not conquered the world; indeed the history of Chinese wars with the Anglo-Saxon shows a great lack of force in China.

Climate: Tropical and temperate zones. Rice dry will keep in almost any climate.

Fashion: Its preparations grace the most fashionable menus.

Aesthetic: The senior writer remembers portions of rice *a la creme* that he ate in Paris in 1862, because of the appetizing relish, and regretted that in 1889 he could not find like preparation.

Religion: It is allowed on fast days in the Latin Church and among the Hindoos.

Tissue builder: Its great use proves this.

Skin: It has not been known to cause eruptions like urticaria or nettle rash, but the prevalence of leprosy in rice-eating countries of the Orient show that it is not a perfect skin food; either it does not confer immunity against infectious skin diseases, or it does not prove strong enough to expel the disease whose ravages with the skin are simply horrible. The writers' experience with a case of leprosy shows that animal food diet is the best; so long as the patient adhered to it the improvement was marked and good; relinquishment of it was followed by death. A sole rice diet with Americans for over forty days prepares the system for a nest of said bacillus of leprosy, or, to put it differently, rice does not offer immunity from leprosy that the association with animal food does.

Fermentation: Sometimes; but not having yeast used in its preparation, it is not so liable when delayed in transit through the alimentary canal. Of course the cooking makes a great difference about fermentation. If it is made insoluble by under-cooking, it will be liable to resist the digestive process and be left a prey to the alimentary canal yeasts. Rice is fermented into alcohol and vinegar in some countries. The saké of Japan is the basis of a rice vinegar used in Worcestershire and other sauces.

Parasites, animal and vegetable: If the plants are of low vitality, unsupplied with the needed soluble mineral food, they will be subject to parasites, but not so much as potatoes. The dense glassy character of the rice grains is a protection; farmers plow to break up resistance to crops; they do not sow grain by scattering it on the untilled soil; the same principle obtains as to diseases getting a nest.

Intemperance: Not much. Is peculiarly a temperance food. Altogether rice is worthy of the high place it holds in the use and estimate of mankind.

RYE

It ranks next to wheat; is mentioned in the Bible quite early (Exodus 9:32); deserves more consideration than it gets in America.

Vegetable kingdom: Is a grass grain.

Mental kingdom: It subserves the intellect.

Good: When properly grown, prepared and used. Not *bad* in itself.

Condition of feeders: Strong, hearty and stalwart, though slow.

Physiology: Much as wheat; tested on patients, rye bread has proved good.

Diseased tissues: Does not produce such, if normal and properly prepared. *Per contra:* "In one city in Europe, there are more people with bowlegs, hunchbacks and other crooked shapes, than anywhere else, and it is said to be because the children do not have the right kind of foods. These little children live on rye bread and black coffee."—Pp. 29-30, New Century Primer of Hygiene, Amer. Book Co., 1901.

Chemistry: Everything there to make healthy tissues; it has a gluten like wheat. Einhoff says the analysis of rye flour is 61.07 starch, 9.18 gluten, 3.28 albumen, 3.28 sugar, 11.09 germ, 6.38 vegetable fiber, 5.62 loss. *See also* table, page 124.

Morphology is much the same as that of wheat, as to teguments, connective tissues, architectural arrangement, gluten and starch cells and fine granules of starch as shown by iodine, other granules not stained by iodine and fine automobile granules. The starch grains beautifully polarize light, are more globar than wheat starch; none oval as potato starch; gluten cells appear smaller than those of wheat.

Sole food: American experience forty to fifty days; rye is the principal and staple vegetable food of the German peasants.

Manifold food: Not as much as wheat.

Cures: It is used early in the cure of organic diseases.

Head: The above shows it has a good effect on the nerve centers of the brain.

Hearty: It could not sustain health in life for forty days unless it were good; but is not so hearty as wheat.

Eyes: It must be regarded as a good eye food, especially as its starch is not separated from the rye mineral elements.

Bone, teeth, nails and hair: Rye has mineral elements enough for these.

How often used: Indefinitely with other foods.

Heat: Rye has abundant starch for all needed heat.

Force: The strength of peasants and the ability of Americans to live on rye as sole food for forty days prove it to be a good force food. The flour eating French army in 1871, fell before the rye eating Teutons, and well they might, fed on impoverished whitened bread.

Climate: Best in cool climes.

Customs: Is used mostly by European peasants as black bread; here is a curious custom; the mass of Europe prefer the black bread, while Americans prefer white. This is on a par with the Chinese using white, and Occidentals black for mourning. Surely there is no accounting for tastes. When will fashion have its dictates (so blindly obeyed) put on a biological basis broader, truer, saner than the æsthetics of color that in one part of the world makes white the same as black in another?

Skin: Confers healthy skin. *Per contra,* it is well known that the ergot in rye, a fungus (claviceps purpura) eaten in Europe by the peasants in black bread has produced dreadful results in the skin, as well as internal organs.

Pumper nickel bread: A coarse rye bread; sample bought in New York City showed a large excess of yeast plants, with sourness, *i.e.,* vinegar. This sour bread must be condemned and the eaters ought to spend the force uselessly used in digesting pumper nickel on some better object. Whole wheat bread would save this loss.

Parasites: Ergot: As said, the people of Europe eat ergotized bread and "terrible and devastating epidemics of dry gangrene, typhus fever and nerve diseases, like convulsions, in Europe and especially France have long been ascribed to the use of this unwholesome food;" a poison in large doses, common sense ought to prevent this, but it may have been eaten from stern necessity. The unusual yeast in pumper nickel bread is also a vegetable parasite, but generally the German rye rolls are pure and free from parasites.

Fermentation: Less prone to same than many other foods; its relation to distilled and malted liquors treated under alcohol.

BARLEY

It is mentioned in the Bible (Exodus 9:31), and by Pliny and Virgil; used now as food chiefly in soups; barley bread is very rare. Chief use of barley is to make beer and whiskey.

Vegetable kingdom: A grass grain.

Good: Yes.

Physiology: It is adapted to man in almost all climes for normal biology when not used as a fermented drink.

Disease power as sole food: Not when common sense is obeyed.

Chemistry: Einhoff found in barley 67.18 per cent. starch, 5.21 sugar, 4.62 gum, 3.52 gluten, 1.15 albumen, .24 phosphate of lime, 7.27 vegetable fiber. Prousb found 55 per cent. of Hordein in barley, but in malt the Hordein was 12 per cent. Perhaps its disuse as bread may be due to the small quantity of gluten. *See also* p. 124.

Morphology: The starch grains are discoid and oblong and may be thus distinguished from wheat and rye. *Specimen from hotel kitchen showed:* Grains partly denuded of the integument, specially at the ends; section at one end, showed some germ buds—teguments solid massive substance cells—gluten cells much smaller than those of wheat—starch grains all sizes, smaller than wheat; great abundance of minute starch grains, some automobile; iodine reaction, purple for starch, gluten cells yellow.

Sole food: Have no knowledge.

Multiple foods: In soups.

Produce disease: Save when turned into alcoholic drinks.

Cure: It is not considered as desirable in food treatment of organic disease.

Head: As solid food, good; as liquid, deleterious to the head because of the alcohol. The food use of barley was great in the days of Ruth, who gleaned barley in Boaz' field; judging from the utterances of the Jews, in those times there was no lack of intellectual development, as their literature survives to-day and is more read than any other. Until conflicting evidence is adduced, barley must be considered a good head food.

Hearty: It must be ranked thus.

Eyes, bone, teeth, nails, hair: As fashion has not dictated its impoverishment in milling, save in the pearl barley, it is good. As a rule it must be stated, that all edible grains by nature, have the proper proportions of starch and mineral elements necessary for man's existence and if there is trouble with said grains, it comes of man, not of God. Experiments noted in "How Crops Grow" show this plainly, to wit: that an excess of soluble mineral food is as bad as no mineral food, and the carbohydrates cannot make perfect tissues in eyes, bone, teeth, nails and hair.

How often used: With other foods indefinitely.

Will barley confer small sized intestines? No, this is only done by animal foods (and by proper exercises).

Heat: The starch furnishes an abundance.

Force: There is enough nitrogen in barley to give force enough for life work.

Climate: Is cultivated successfully within the Arctic circle, and in the tropics at elevation and has the largest range of all the cereals.

Customs: Great changes in moderns. Not used for horses' feed nor man's so much, but barley is now the great staple of malted liquors, and some whiskeys are made from malted barley by a second distillation. Probably a two-thirds diminution of gluten as compared with wheat is the cause of the decline of barley bread, as the vesiculation of breads depends on the gluten and also the less gluten the less nitrogen, but ethics has not condemned barley to impoverishment, as it has wheat.

Aesthetics: If it has now been tabooed for man except in soup, it can hardly be said to have met the demand of the palatal taste; in the products of distilleries and breweries it meets the æsthetics of taste of multitudes.

Builder of issues: Good.

Effect on skin: Good, so far as we know.

Fermentation: It must (as it is mostly starch) when lodged in alimentary canal, by arrested digestion or by diversion of nerve force.

Animal and vegetable parasites: We do not hear of there being any in the case of barley; for instance, when organisms are preyed on by parasites, it is generally because their vitality is impaired beforehand; this principle should never be forgotten; it orients all through medicine, taken in the broad sense; as we repeat our meals daily, so should we have this principle repeated here.

Intemperance: As now used it would be difficult to be intemperate with barley bread, as there is so little of it, but yielding for the time to the plea that alcohol is a "food" then barley may be and is a source of intemperance. Malt liquors are really wines (G. B. Wood). It is possible to drink too much beer, and ales and porters both of which are merely stronger beers. Probably the reason why barley is selected for the beer family is because of its less nitrogen, gluten and mineral salts.

CORN—HOMINY

Corn is largely used in America; is a grass useful to not only man, but its seeds, leaves and stocks are food for cattle and horses. In the Southern United States and Mexico, maize is the great staple cereal food. But it is used mostly as hominy, which is the corn grain deprived of its tough coat of cellulose.* Corn is largely fed to cattle, swine, horses, mules, hens, ducks, geese; is a great food in the new world where it originated; abroad, it is not so great.

Vegetable kingdom: Organic.

Mental kingdom: Its general use shows it to be in this kingdom, because it has conferred mental powers on its eaters, when used as a solid food. (*See* Alcohol as to fluid foods.)

Good: Rightly used; to those who judge goodness by money, it may be said that the 1898 year book of the United States Department of Agriculture, p. 678, gives tables of the principal crops as follows: corn $836,439,288, wheat $513,472,711, oat $232,312,207, rye $24,589,217, barley $45,-470,342, potatoes $91,024,521, tobacco $47,492,584, cotton $326,513,298. Whence it is seen, that corn is the most valuable crop in the United States; three-eighths more than

* The word "corn" includes wheat, maize, rye, barley and oats as used abroad, but in the United States "corn" means maize alone. It is important to remember this here, in order to avoid confusion.

wheat (the imperial grain), and almost thrice that of cotton, once called the king of all crops.

Bad: If not rightly kept, prepared and used.

Condition of feeders: Is adapted to all ages beyond infancy.

Morphology of corn: Taking the grain of Northern corn, the main foodal points in its anatomy are first, a thick, tough coat of semi-transparent cellulose almost like the cornea for density, toughness and hardness. Second, Next comes a stone like, chitinous, somewhat transparent reddish substance at the rounded distal end of the grain, which of course is quite indigestible. Third, Oil. Fourth, Starch grains which are small like rice starch. Fifth, Each corn is an ovary flattened on two sides, which are bevelled in the midst with a groove, as if made with a gouge; at the pointed or proximal end, are the remains of the silk, which is a long tube through which the pollen from the male flowers goes to fructify each vegetable egg; the white or Southern corn differs from the New England corn by having less of the chitinous substance and more of the starch whose whiteness gives the name; the protective coat of cellulose is so protective that its removal is needful for the perfect digestion, hence we have as our subject mainly:

HOMINY, which is made by soaking corn over night in wood ashes and water and then pounded with a wooden pestle in a wooden mortar, removing said outside skin and leaving the substance or parenchymatous starch with its oil for food. This is independent of the oil from corn smut, which oil probably is no more than the interstitial oil, utilized because the corn is spoilt for use as food by the fungus, that thrives best in wet weather. (Corn oil is an article of commerce in the United States.) When corn meal is used, the tough coat, the chiten and the oil all ground up together form obstacles to digestion.

Morphology of hominy: It is made up of a starch that is cooked and hence does not polarize light, but the whole hominy does not give the reaction of dextrine with the Fehling's test.

Chemistry. *See* Maize, p. 124. The fact that corn has so many good chemical elements does not prove its fitness for man; the structural anatomy has much more to do with its dietetic value than the chemical. Go into a chemist's shop and select the elements as laid down in their analysis, eat them in their nakedness and you would not expect the same result as when these elements are dressed in the organic fabric of the corn. For the grain may environ these elements in such tough indigestible fabrics, as to defy the powers of digestion; this is what obtains in corn, and the public for once has found out how to get over this difficulty by hominy.

Physiology: Hominy has been proved a food able to fulfil all functions of the body.

Disease making: Not when used with common sense. It does not destroy tissues.

Sole food: For forty days. (Green corn, only for a short period, before derangement sets in.)

Manifold food: As *meal,* it is largely used in New England in *Boston Brown Bread.* This is made of rye, corn meal and molasses; *Brown Bread* (*American*) is made of unbolted wheat flour and corn meal; these are fine foods. Corn is also used with sweets, milk and fruits in puddings. *Indian pudding* is made of corn meal as a basis. *Hominy* is used much with milk, cream and water.

Cure disease: Hominy is one of these cereals used in the curing of chronic diseases.*

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* Some decades ago a Kentucky surgeon used to prepare cases of vesical stone for operation by a diet of milk and well cooked corn meal; this dietetic practice brought good results, as he gave his patients only two digestive problems to solve.

Brain: Not equal to wheat; it has nerve food enough for man's needs.

Hearty: Yes, on general evidence. It needs more experiments in this direction.

Eyes, bone, teeth, nails, hair: It answers the demands because it is not an impoverished food.

How often used: At every meal like rice and wheat, if desired.

Heat: In addition to starch, it has oil to burn for heat, so it is a good food in the chemist's eyes. It ought to be better than wheat as to heat, on account of the oil.

Force: In army usages, it excels wheat preparations, and its use by many farmers shows it has force to confer, even if it is not so easy as wheat of digestion, to which open air exercise is favorable as all know.

Green corn: This is a food much liked. The fresher it is, the better; we have recommended canners to conduct their operations in the cornfield. Green corn deteriorates rapidly by keeping. It should be tender when plucked, and if immediately cooked and eaten, is doubtless as good as hominy. In a History of the American Revolution (Boston, Stimpson and Clapp, 1832) a London reprint, page 131, says that General Gates' army in North Carolina had to eat "green corn and fruits met on the line of march;" the consequence was "that the army was thinned by dysentery and other diseases usually caused by the heat of the weather and by unwholesome food," so that green corn in excess has been proved to be a bad food. It is added that good beef and half pound Indian meal rations at Deep Creek invigorated by their welcome refreshment. Comment is needless.

Climate: It has a great range and its protective envelopes will make it keep in every clime, provided it is not wet.

Ethics: It can hardly be called a fashionable food, although the gold yellowness of corn cakes makes them acceptable on the tables of the bon-ton. It is rather the food of the people who eat to live and do not live to eat.

Religion: Noted in the Bible, though the word "corn" as used there means wheat, rye or barley. The Latin Church use it on fast days. Five grains of corn was the ration of the Pilgrims at Plymouth at one time of famine, and this is sometimes repeated on Plymouth Rock anniversaries in New York; it was the North American Indian food and the said five grains of corn is an exhibit to most forcibly remind how the *Pilgrims* suffered to give the keynote of religious toleration and liberty, to a nation whose prosperity is the marvel of the world.

Skin: It is good; leprosy (common in rice eating nations) is unknown amongst hominy eaters.* No doubt corn might produce skin diseases in those predisposed, for example: to eczema or salt rheum. This is on the principle that the constitutional force that kept the eczema latent was so used up in digesting said corn that the eczema appeared, as prisoners will escape if not held in check by the constitutional measures always at work in a good government, or to use another civic illustration when the authorities are powerless there are mobs. Disease are mobs ready to work evil if not restrained, so that life is a question of vital force. Government of the body systemic overthrown is accompanied with disaster, as when the body politic is awed.

Fermentation: The elimination of the husk of corn is a great preventative of fermentation in the alimentary canal, for it allows access of the digestive juices to the substance of the grain.

Parasites: Smut is one, but its blackness deters its use as food. There are also meal worms which are the larvæ of flies deposited in meal (that was not properly cooled after

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* Coarsely ground corn food is thought to be a cause of leprosy in Mexico.

the heat of grinding) which cakes, heats and ferments with a vinegary smell; the meal becomes sticky like dough and is repulsive to the eye, smell and touch, and common sense rejects it.

Intemperance: In the solid state as prepared food it does not foster intemperance, save from gluttonness perhaps, when some one has been starved so as to lose the control of common sense. There is something very satisfying to the palate in Boston brown bread, but we have never known of its being over eaten. With these limitations hominy is par excellence a food of the sober and temperate.

SAGO

This is a nutritious food, but only in the last half century has its good qualities been known; it is a staple tropical food, palms and cycads; these are exogenous plants increasing on the outside. Sago comes from the so-called pith; sometimes seven hundred pounds are taken from one tree. It is one of the first six or seven foods of the vegetable kingdom that maintain life the best.

Mental kingdom food: Because of its sustaining life as sole food for so long.

Bad: When not in normal condition, as to growth and preparation.

Morphology: It differs from most vegetable foods we have named, in not being a cereal or seed, but is from the internal or medullary part of the stalk of the sago palm, which grows sometimes to a height of thirty feet in some cases; as age goes on, the central parts of the core are absorbed, leaving the palm trunk hollow; it may be that this deposit is for food for the palm; also the core may not be furnished fast enough to keep up with the exogenous portion. The core is made of large starch grains, cuboid or solid cup or mullar shaped, easy to separate and preserve; hence man does not have to resort to mills for its preparation. It is easy to prepare for market and opposes little or no resistance to the digestive organs, hence it is used among the sick.

Chemistry: It is a carbohydrate and differs from other starches only in its morphology. Nitrogen rarely over one per cent.

Disease causing: It does not, unless used singly too long and improperly prepared.

Fed singly: Forty days according to American tests.

Manifold: Not generally, save with sugar, molasses and nutmeg.

Cures: Very much, especially in convalescence.

Heart, eyes, bones, teeth, nails, hair, and skin: These were not impaired by forty days sole feeding.

Heat: Has plenty heat producing elements to keep man warm.

Force: Has enough for the milder efforts of the tropics. Doubtful if it could furnish enough to run an army, indeed sago is used in health as a dessert mainly.

Climate: The lands where sago grows and is mainly eaten, are Cochin China, Japan, East and West Indies, Bahamas, Borneo, Celebes. Grows best in low moist places.

Fashionable: Yes.

Religion: Not mentioned in the Bible and not beloved by any cult.

Fermentation: Being so digestible, it does not lodge so as to ferment.

Parasites: Sago is prepared in our market and is not subject to parasites.

Intemperance: Probably none. This is a good showing for sago.

From time immemorial tapioca has been used in South America whence it was introduced into the United States. It is said of tapioca (which is the starch from the Janipha Manihot) that it yields the largest weight of tubers to the acre, far exceeding other root crops, and it would appear that the United States Government would do well to promote its larger use, especially among those who are poor. There are two kinds of Janipha, sweet and bitter, both edible with proper preparation.

Good: With a high reputation, has long been esteemed a delicacy for the sick.

Bad: The bitter variety is bad from its prussic acid, but this being very volatile, is easily removed from the tubers grated into pulp. Indeed tapioca according to Cuzner is the mandioca or cassava starch, heated on iron to dissipate this very prussic acid. Cassava is the proper name, but tapioca is best known and safest after it has been heated as stated.

Morphology: Little is known of it but the mullar (mill stone) starch grains, as it is a tuber like the white potato, it probably has like connective fibrous tissues and the gubernacula.

Chemistry: Water 70.44, ash .57, oil and fat .38, glucose .28, sugar, 5.19, crude fibre 1.19, nitrogen 1.03. starch 21.24. Second quotation: Water 11.4, protein 0.4, fat 0.1, carbohydrates 88.0, ash 0.1, calories 1650.

Physiology: Is capable of sustaining all the body functions for forty days according to American tests. Here is its chief commendation and the reason why it is treated of here among the royal starch foods deserving the first consideration.

Disease: Decidedly produces it, if the prussic acid is not removed.

Manifold: With milk and sugar in puddings.

Cures: When the sick are ready for it, is very desirable.

Brain: Fair.

Heart: On the Andes, the natives of Peru have not been able to get on with tapioca unless they add coca, as they do also in mining, for without coca they would perish. (*See* The Care of the Aged.) Do not think tapioca is hearty, like whole wheat preparations.

Eyes, bone, teeth, nails and hair: The preparatory process of tapioca not separating the mineral elements does not leave it impoverished; still the small per cent. of ash does not augur well for these tissues and shows that there should be more investigation made as to this question; this small percentage may have operated against the general use of such a prolific plant as the Janipha.

Intestines: Make them large, as with the eating of all starchy foods, more bulk is required than animal food and also more liable to ferment.

How often used: Daily for forty days according to American tests.

Heat: Starch enough, especially in warm climates.

Force: While it has enough to last for forty days normally, there is hardly enough to fight the hard battles of life.

Climate: A tropical food more than in temperate zones.

Fashion: The æsthetics of fashion do not seem to patronize tapioca; the people who eat it most are not of the bon-ton.

Religion: Tapioca is not mentioned in the Bible or in the dictionary of classic Rome. The Latin Church allows it on fast days as it is largely starch.

Builder of tissue: In a comparative degree.

Skin: Good as far as known.

Fermentation: Does not ferment in the alimentary canal very much because of its easy digestibility or it would be poor food for convalescents.

Parasites: Tapioca is quite free from them, as it reaches our markets, because of its being separated by washing the grated pulp in many waters, letting the starch settle and pouring off the water; the starch is then heated on iron as before noted; this process must separate parasites, and if there are any, the heat must kill them.

Intemperance: This has not yet been connected with tapioca.

Adulteration of tapioca: Tapioca is so cheap that it would seem needless to sophisticate it, but Dr. Wood says a factitious tapioca is found in the shops consisting of small, smooth spherical grains and supposed to be prepared from potato starch and sold under the name of pearl tapioca; but if it can be raised so much cheaper than potatoes acre by acre, it would seem as if there was no money in substituting potato starch for tapioca.

DATES

Fruit of the Phoenix Dactylifera: In some countries the date is the chief food. In Arabia "three date palm trees are enough to keep alive an Arab, wife and donkey for one year."—Prof. Paulus F. Reinsch. Indeed, the donkey and camel, also eat the stony pits of the date seeds. The trees grow to be one hundred feet high, bearing four hundred pounds of dates sometimes; are one of the most beautiful endogenous trees extant. They are noted in the earliest history. Other authorities say that dates are and have been almost the sole food of several nations. Dr. Worrall (medical missionary of the Reformed Dutch Church in

Arabia) states that there are some seventy-seven varieties, only three of which find their way here and these are the poorest.

Mental kingdom: Certainly. The Arabs furnished the system of numerical notation, an arithmetic and geometry, and have a hard language to acquire; the Egyptians furnish much mental food in their libraries.

Good: Very. *Bad:* No, save from abuse in preparation and consumption.

Condition of feeders: Dates must agree with nearly all classes of human feeders and with donkeys and camels. Their sweetness is also a charm, though we, who have used only the imported dates, know nothing of the gustatory delights of the date fresh from the trees.

Morphology: The skin is tender and the substance soft and digestible. The seed or stone is not eaten by man but by camels and donkeys. There is nothing in the edible part of dates in the form of tough cellulose tissues to prevent their digestion and assimilation. The cells, however, do resist digestion somewhat, as the bowel discharges of date eaters are well loaded with them, but the resistance is not in tough cell walls, but in the amber like substance of the cells which appear like hoarhound candy.

Chemistry: The sugar is glucose, twenty-five per cent. of the drupe. There is a sugar made from the palm tree juice like maple sugar, this sugar being the same as the liver makes.

United States Government analysis, edible portion: water 38.2, protein 2.9, fat .3, carbohydrates 35.9, crude fiber 21.3, ash 1.4, calories 1,130. As purchased: refuse 6.5, water 35.7, protein 2.7, fat 3, carbohydrates 33.6, crude fiber 19.6, ash 1.3, calories 1,055.

Physiology: They are a physiological food specially adapted to the climate where produced.

Disease producing: Possibly because of the carbohydrates, but the glucose is a good sugar to eat. One would think that the one-quarter sugar would produce trouble. People sick with albuminuria, fatty epithelia and casts, have by living on beef got rid of them, and when dates were eaten, the albuminuria, fatty epithelia and casts would return (as they do by putting common sugar into tea and coffee), but not in some instances and in others only slightly and to a far less degree than when cane sugar is used. This is probably because the date sugar is a glucose, the normal sugar of the liver making. Dr. Worrall states that blindness is very common in Arabia. It is possible that dates long used by generations may produce this, after the artificial cataract production in frogs and guinea pigs as before noted. Elephantiasis Arabica is also a local disease. Vast districts of Europeans live on black bread, who suffer as said before from the ergot poisoning, but nothing is said of the prevalence of elephantiasis, so on this basis dates and black bread solely fed may be suspected. Men fed solely on wheat after forty-five days showed disease lesions. The position here taken is that no one food, save beef, can be lived on indefinitely—and there are exceptions to this rule— and that it is best for men to generally use those foods that have been proved to solely sustain life the longest. Dates suffer no impoverishment of mineral elements. This is certainly in their favor as a non-disease producing food.

Sole food: Accounts vary. Dr. Worrall states that four dates fresh from the palm were enough for his dinner and that he lived on such feeding for three days in a desert. They are the sole food of caravans in Arabia, also of the boatmen on the river Euphrates. Prof. J. Solis-Cohen, M.D., said, when a schoolboy his mother used to give him money to buy a lunch of crackers, but that he spent it for dates and found them more than an equivalent for a dinner. The senior writer has experimented with dates as a sole food for dinner in travelling; he has repeatedly found them an ample dinner, indeed one-third pound sustaining more than any other food from the vegetable kingdom, wheat not excepted.

Manifold food: They are usually eaten with black rye bread in Arabia; in America and Europe they are used as desserts. Confections are made from them. Dates mix well.

Cures: Dates have not been used for this save in the senior writer's personal experiments. He thinks they might be used more than they are, but with caution.

Head and heart: Good.

Eyes: Doubtful, from the prevalence of eye disease in Arabia; in fact, Dr. Worrall came home to study up ophthalmology because of its importance in Arabia.

Bone, teeth, nails and hair: Further study is needed on this point.

How often used: Dates and black bread and sometimes wheat and rice are constant food for Arabs.

Heat: Gives same abundantly.

Force: Caravanmen, boatmen, camels and donkeys thrive on dates, which confer force enough for their occupations. Some force comes from the carbohydrates in dates, but not all. Dates, not impoverished in preparation, furnish nitrogen and other elements, as sulphur, lime and phosphorus in proper proportions to the carbohydrates.

Climate: Tropical climate food. They stand keeping in all climates well, protected with paraffine paper or other wraps to prevent evaporation, though they do best in modern cold storage. The deterioration is in drying up and the sugars being crystallized out as the water is evaporated. They do not mould like other drupe fruit, raspberries for example. Our Government might in its new possessions raise all the dates needed in its armies, to say nothing of their being exported to America.

Customs: Hearing that Turkish dates were the best, the late Rev. Cyrus Hamlin, D.D., LL.D., was written as to them. He said that no dates were raised in Turkey, that they were brought from lower Egypt and dubbed Turkish. Inquiries at the New York Turkish Consulate confirmed this, so, seeing "Tunis" dates advertised at a fruit stand on inquiry it was found they were put up in Paris and sold at twenty-five cents per box holding a pound, while ordinary dates wholesaled at four to five cents per pound; these were grown in Tunis probably and had a better sale as put up in Paris. In Philadelphia, dates were found in pound boxes put up at Bozrah on the Persian Gulf; they were evidently for this market as the imprints were in English and sold for ten cents per pound. Dates would be better if the boxes were made air tight, still the hygroscopic properties of these dates were such that a short exposure to a moist atmosphere restored to them a sufficiency of moisture. This was specially the case at West Falmouth on Buzzards Bay in the summer when dates seemed to gather moisture from the air like the chloride of barium.

Fashionable: But not to the extent of confectionery; it is to be wished that they were, as they are the least harmful of all sugar foods and it would be a boon to human life if dates could supplant cane sugar candies. To repeat, they have the proper amount of mineral food, are digestible, assimilable, less provocative of fatty ills, confer force, even to people who are subject to hard labor, and do not cloy like saccharin and sugars. Their use dates back to the earliest periods of man's existence, while white sugar is a modern invention, due solely to the dictates of fashion, assuming that *white* is the æsthetic color for sugar as well as wheat flour.

Religion: They are not prohibited by any religion as far as we know. Palms are much mentioned in the Bible as emblems of joy. No wonder, as Arab writers have given three hundred and sixty beneficial uses of the palm tree to man.

Builder of tissue: Yes.

Skin: As before noted, they do not protect against leprosy and elephantiasis, which diseases are often found among Arabs and not among us who eat dates simply as dessert. It is not probable that dates induce said diseases, but they do not confer immunity. At the same time, it should be said, that the hygiene of the savage races is not equal to the hygiene of the civilized (though the latter is not perfect), and it may be that the Arabs' unsanitariness and the absence or diminution of animal food are the causes of said diseases. A digestible food as dates ought to be healthy skin food, used in proper quantities.

Fermentation: As might be expected of the sugary juice of the palm tree, it has been fermented into alcoholic liquor. The sugar and protoplasm of the date, if not digested, ferment in the alimentary canal. But the notice of this is not enough to base much of an opinion upon; until more evidence is adduced to the contrary, we must say that dates are not liable to fermentation and must be regarded as a good food in this respect; dates act as a laxative when eaten alone or in excess with other foods; this is due to fermentation, though the morphology of the feces do not show much colloid. This is a recommendation. Constipation must be combatted by supplying the lack of force that causes it. Dates supply this nerve force as they are not impoverished as common flour is.

Parasitism: We think not. They ripen on the palm tree without the care bestowed on wheat and other grain. There is a sorting of the qualities and sometimes a process in the drying, but the ripened dates are taken from the tree and immediately packed as a rule. The twenty-five per cent. of sugar protects from alcoholic yeasts and the drying still further protects. Sometimes dates are hard like half-cooked potatoes. Even the date hygroscopically moistened in the air of Buzzards Bay and kept uncovered would neither mould nor decay, while unleavened bread would in a few days in the same weather. There may be animal date parasites as on figs, but we have never met them. Dates are high on the list of foods free from parasites.

Intemperance: Not a great factor in same.

"*The oldest prescription:* The oldest medical prescription in existence bears date of 4000 B.C. It was discovered in an Egyptian tomb, written on papyrus, and has been deciphered by an English professor. It bears evidence that it was intended for some bald-headed Egyptian and reads as follows:

	Parts.
Dog's paw (calloused part)	1
Dates	1
Donkey hoofs	1

"Boil the whole in oil and rub the scalp actively with the mixture."—*Journal New Jersey State Medical Society,* June, 1906.

APPLE

Among the Romans, supper was finished off (dessert) by apples, which was an elastic word like "corn" and included oranges, lemons, citrons, etc. The word apple comes from the Anglo-Saxon; the apple tree is one of the

Roses. Botanical name is Pyrus Malus; the latter is the Latin for apple. Apples were known in Solomon's time; are largely a staple food of modern civilization. They confuse science and show that the common people are more discriminating than the botanists. The Standard Dictionary gives a list of three hundred and twenty-four varieties, few of which are in the botanies, where they are all Pyrus Malus, and no attention paid to the difference, for example, between a Baldwin and a Spitzenberg or a Nonesuch. Apples are much exported to Europe; cold storage preserves them finely for market; are most largely raised in the Western States.

Kingdoms: Vegetable and mental, for they affect the mind and senses.

Good: But not in the sense of wheat, barley, rye, rice and dates.

Bad: Yes, when decayed, overgrown, fermented, worm-eaten, rotten, used as sole food or without common sense.

Condition of eaters: They are for well people as relishes, appetizers, and not specially for the sick, save in convalescence.

Morphology: The beautiful skin is not easy to digest; but the substance is made of protoplasm in cells which are compressed together to a moderate degree of hardness in the unripe and to a limited softness in the ripe; these cells have a nutrition, that is affected by pressure, even after being picked and put in barrels; this is shown by the facets formed by the pressure of the barrel head; the contour is flattened, the skin is blackened as if there were rot beneath, the touch is hard like a board in marked contrast to the rest of the apple; microscopical examination shows this hardness to be due to amyloid or starch-like bodies; the interesting part of this is, that amyloid bodies are found in the first stages of fatty degeneration in man, which ill is due, according to the English idea, to a retarded and impeded circulation; the barrel head must have retarded and impeded the osmosis of the ultimate apple cells by pressure, so that here we have an artificial production of apple fatty degeneration; besides some specimens showed globules and granules of oil, thus completing the said proof. There are no firm, tough, connective fibrous tissues in the apple substance, so that the raw, ripe apple can be eaten and digested, while the process of cooking breaks up the cells into homogeneous masses still more easy to digest; further, raw, unripe apples are made edible by the changes brought about in cooking.

Chemistry: Apples are mostly carbohydrate food like starch, glue, gelatine, sugar. The protoplasm of the cells change (as seen) into amyloid and fat. The basis is a sugar, of which the juice is so full, that it ferments into cider with a percentage of alcohol 5.81 to 9.5. In the 40's the senior writer heard Ralph Waldo Emerson in a lecture say: "Apples are great chemists to produce such fruit from the soil and air."

Pippin, edible portion: water 85.3, protein .6, fat 0.1, carbohydrates 12.7, crude fiber 1.1, ash 0.2, calories 270. *See also* p. 124.

Apples must be regarded as a sugar food, hence not to be used before convalescence. The malic acid, C4, H6, O5, is sweetish and not sufficient to build up normal tissue.

Physiology: Used in proper proportions, apples are a biological food, easy to assimilate but not very nutritious. They are rather relishes and are anti-scorbutic. They are very reproductive, but bear best every other year. The Baldwin is the best apple. They have always been a favorite fruit.

Diseases: In excess, they cause obesity and fatty ills, diarrhœa, fibroid thickenings of intestines, catarrhs from the reflex action of carbonic and other gases—alcohol to partially intoxicate. (*See* Fermentation.)

Sole food: We do not know, but it cannot be very long.

Manifold food: As dessert, emergency food and in combination with sugar and other foods in sauces, pies, puddings, dumplings, apple butter, etc.

Cure: Relieves constipation by producing diarrhœa to get rid of fermenting matter; this is not ideal; the constipation should be relieved by increasing the amount of nerve force. They also come in after the seven royal vegetable kingdom foods and sparingly. They are too sugary to cure much of themselves. In scurvy, apples are fine and are preventative. They are good food for horses and cattle whose digestive organs are better prepared for their exclusive use than man's. Cider and vinegar are good for liver complaints in some people; the vinegar acts on the clogged livers while yet in others it hurts.

Head: Hardly a first-rate head food, as they do not have mineral elements enough. (*See* Fermentation.)

Heart: Are not hearty food, though the heart may get on with them, if not eaten to the fermentation point.

Eyes, bone, teeth, nails, hair: Apples alone do not have such an abundance of mineral elements to make such.

How often used: In the season, with other foods, right along if eater is healthy.

Action on intestines: Tendency to make them larger by fermentation distension and partially paralyzing them by the gases. The green apple colic in the small boy needs no description here.

Heat: The fact that they are relishes more than food shows that heat, while necessary, is not everything as food.

Some physiologists regard the heat of the body, aside from slow combustion, to be due to phyto-chemical actions, as when lime and water are combined in the mortar bed; but the force does not come from the heat; the heat comes from the force more often; exercise warms and heats by the very expenditure of potential force made actual; a man running a race does it by the force expended, but he could not run if frozen, so that heat does predispose to the exercise of force and to the functions of life, but it is a mistake to lay the production of force to heat; it is the other way in actual energy; heat is a form of motion as Rumford pointed out, and carbohydrates furnish heat in combination with oxygen of the air; nitrogen has very much to do with the force as we have heretofore noted. If heat furnishes the force, why not feed an army on apples?

Force: As relishes are useful as oil to the machine, but not to afford power.

Climate: Apples are found on all the Continents; they flourish best in temperate zones.

Customs: Have made apples a dessert as in ancient Rome when supper was begun with eggs. Ethics have not been so hard upon apples as on common flour. Probably apple pie is the one most generally in favor.

Aesthetics: The bright rosy appearance is one great reason of their fashionable use for dessert, while the palate music is very attractive and appetizing. Red apples and green leaves are so tempting to the tastes of boys that they cannot resist stealing them even in the most protected places in New York City.

Religion The Bible tells us that it was the æsthetic sight of the apple that overcame Eve; but apples have nothing to do with religion now save the sin of stealing and thus violating the eighth commandment, *Builder of tissue:* As we have seen, they are not competent to build good tissues, and as they are largely carbohydrates, they make fat.

Skin: Has no bad effect save as to increasing the fat underneath and possibly changing it from solid fat to oils.

Fermentation: Have long been known to ferment in the alimentary canal when lodged. As said before, apple juice easily ferments exposed to the air which is more or less full of the alcohol and vinegar plants. No doubt these yeasts are eaten with the apples and with other foods and add their strength to those that are in the alimentary canal all the while. When cider is distilled, cider brandy results which is so powerful as to have the local name of "Jersey lightning," and no wonder, as apples are more fermentative than the grains which whiskey is made from. (*See* Alcohol and Fermentation.)

Parasites: Are subject to rot which is caused by a very delicate and minute mycelium of a fungus. It almost eludes inspection, but the mycelia environ the cells and cause the protoplasm to soften and turn black. It is probable that the absence of suitable soil food is one cause, giving a weak power of resistance to the parasitic fungus whose spores are probably always present; a wet season helps the fungus as fungi are killed by the sunlight. Then insects deposit their eggs in the growing apple and the larvæ are the worms familiar to apple eaters. The alcohol and vinegar yeast that collect in the skin are also vegetable parasites; they are useful in that apples that are left over are removed by being turned into alcohol and vinegar to be dissipated in the atmosphere. Caterpillars and canker worms interfere with the production of apples, sometimes destroying the crop and giving man a hard fight to save this highly æsthetic fruit. In this matter the labors of the United States Department of Agriculture should be mentioned with highest praise.

Intemperance: The amount of alcohol is so small in cider that drunkenness is not often seen from it. Sweet cider is used more on farms than in the liquor saloons. Hard cider is good for the liver in some cases, but this is a medical matter. The daily drinking of cider is not healthy. Indeed when we consider how vinegar has ravaged the human race (and cider vinegar is the most used) a terrible accusation can be made against apple juice.

CELERY

It it food: Yes and no. It is a relish, a light assimilable food, but not of itself enough to support life; it promotes appetite, zest and a desire to "lick again" substantial food, inciting the spirit or desire for said food which otherwise might cloy. It is named here as it is almost the only food from the vegetable kingdom that is suitable for most cases of chronic disease treatment, hence also its great value to the well.

Vegetable kingdom: An herb of the Parsley family, mentioned in the old Roman writings; also used a long time in France; generally eaten raw; formerly the root was eaten; now the stems are blanched by heaping the earth around, which is done also to make them tender and crisp.

Mental kingdom: Certainly, as it charms the mind through the eye, the palate, and its digestibility.

Good and bad: The test of ages has shown it to be good, including modern observations in the morphology of the blood and secretions; in excess patients show effects in the deterioration of the physical signs revealed by the microscope and chemistry. But this is no objection, as common sense confers wisdom enough to guide its use.

Condition of feeders: The strong point in the favor of celery is that the sickest people can partake of it as a rule; it exceeds all other vegetable kingdom foods in this respect.

Morphology: Its structure is made up of soft tissues whose crispness depends on the water in the cells; the fibers are not tough but fragile and run longitudinally; their cellulose appears plainly in the morphology of the bowel discharges of the eaters. If the stalks have not been properly covered by moist earth the texture is dense and hard to digest; this process is called "bleaching," as the chlorophyll cells do not develop away from sunlight and thus the fleshy whiteness of the stalks with a tinge of yellow seen en masse; there is nothing ghastly in the whiteness to repel, but it is more like alabaster, thus keeping up its character as a relish.

Chemistry: United States Government report: refuse 20, water 75.6, protein 0.9, fat 0.1, carbohydrates 2.6, ash 0.8, calories 70. It has not much sugar and hence its great applicability. The seeds have an active medical principle and aromatic oil, while the same oil is present to a less extent in the stalks and give it its appetizing power.

Physiology: Celery acts on the body physiology by stimulating nerve action that controls the digestion; its mildness and surety are great recommendations; its aromatic oil acts on the nerve centers; we know only the results enough to repeat that celery is a physiological food of high character properly used.

Disease: Used to excess, it will turn restored normal morphologies of blood and urine back again to abnormal, but there must be a gross violation of directions to do this. Celery does not destroy tissues in fatty degeneration, but it does not have elements enough to sustain the wear and tear of active life, and yet its agreeing with diseased conditions so well is a great commendation. Celery has been supposed to cause epileptic fits or aggravate them. This might be from over-use. (Parr.)

Sole food: Not positively known but not long. It feeds ducks right along, but they get other food, and must eat many infusoria that are in the waters they inhabit, as shown by the movements of the bills and their peculiar sifting powers.

Multiple food: Yes, though usually eaten raw and not in combination save in salads. It is sometimes baked or stewed.

Cures: It certainly does and must be regarded by physicians as one of the kings of the vegetable kingdom. It can be used before wheat, rye or rice in the treatment of advanced cases of chronic disease. This is saying a great deal.

Head: By exciting the sympathetic nerves the voluntary head nerves are helped. Acting negatively it is a good brain food, as nothing disturbs the cerebral voluntary nervous system so much as difficult stomachic and intestinal digestion.

Heart: So far as it furnishes nerve food it is good for the heart, like many aromatic diffusible stimulants, but not equal to wheat or beef. Cardiation could not be kept on celery as sole food, but as one that makes us "lick again."

Eyes, bone, teeth, nails and hair: Not good except indirectly as a relish, as it has too much carbohydrates.

How often used: Very often in proper way as a relish.

Heat: Some, but not enough for cold weather. It may produce heat by stirring up the digestive functions to greater work than otherwise, or it may act as an "oil to the machine" and thus make the body systemic run easier and saving up the forces, heat, etc., for use in other work.

Force: None, save indirectly or reflexly. As it promotes the appetite for meat, wheat and other forceful or hearty foods then it must promote actual and potential energy, but much as we esteem celery we would not undertake to do a hard day's work on it alone. Possibly in the aromatic oil of celery there may be the dynamic nitrogen.

Climate: Temperate zones are for celery; most used in cold weather, though eaten all the year around; it does not stand keeping in warm weather, but in the winter, celery is sent in barrels all over the United States from the Dutch settlements in Michigan.

Customs: Have made it a fashionable food, not seen much on the tables of the poor, though it is easily raised and well might be.

Aesthetic: In the gracing of the tables of banquets, among the glassery, the cutlery, the gold and silver plate, the art of the confectioner and the general architectural production of the cuisine, celery is never out of place. The mere sight makes the mouth to water with the salivary and parotid secretions that said glands pour forth preparatory to digestion, even before a particle of food is eaten. Then the mild, aromatic, nutty order is also music to the nerves of smell and adds to the excitation of the whole body systemic to be ready for its æsthetic food.

Religion: Celery is allowed on fast days in the Latin Churches; otherwise its relations to the world's religions are not marked. On Thanksgiving, always accompanies the indispensable roast turkey.

Builder of tissues: Not directly, but indirectly, for its use causes more tissue building food to be eaten and assimilated.

Skin: No special action.

Fermentation: None if properly used and when improperly used it does not ferment badly, hence its capability of use in cases of disease; there is not much yeast in it, or if there is, it does not take hold; it always resists quite well the action of the alimentary canal yeasts; this is probably due to the little sugar in its composition.

Parasites: Not many if properly washed and cleaned;

rather than decay like grapes, it wilts and becomes flabby, loses its crisp bite and is not beautiful. The great trouble is in its not being properly bleached, thus making it tough, rankly medicinal and unæsthetic. It may be boiled in water or steamed, as we do other vegetables, which raw are not digestible, but cooking destroys the fine qualities as food.

Intemperance: Not very often and when existing, is of a mild type. It must be used with common sense as there is danger in all foods of eating to excess.

OAT

Virgil mentions it and it has been used for horses and man so long that that its place of origin is unknown. In modern times it has been particularly the food of the Scotch and the North Irish. Oats afford sufficient nourishment to the Highlanders who are the most vigorous people in the world. (Parr.) But this may be in spite, not on account of oats. "John Mayn in the first book of his history of Scotland contends much for the wholesomeness of *Oaten* bread;" *Burton,* Anatomy of Melancholy. To-day advertisements abound for prepared oat foods as superior to wheat, the royal grain. Parr puts oats as inferior to rice and wheat. The conventional idea is the opposite. In our opinion oats make work for the physicians in coughs, colds, catarrhs, all of which indicate a lowered state of vitality among indoor eaters. Outdoor eaters in mountain air where exercise is essential to life keep the downward peristalsis in motion and make very much more out of oats than sedentary people; if their oaten meal does not digest, it is not retarded in the alimentary canal to ferment.

Organic and inorganic: There is more silica in oat meal than in wheat; there is less gluten, hence its dough does not readily aerate (vesiculate), is heavier and harder to digest; yeast does not readily raise oat dough and hence the heavy, soggy bread. This is due to an excess of inorganic matter.

Vegetable kingdom: Avena Sativa, a grass, two to four feet high with an excess of mineral matter as compared with wheat.

Mental kingdom: It has influence on brains; the Scotch are a brainy people, and then on the other hand its hard digestion produces acute ataxia, dizziness, dreams, false ideas, bad temper, reeling as if drunken; catarrhs of the head produced by oats are subversive of intellectual and mental capacities. To test this let a doubter live on oat meal, as sole solid food for ten days if he can, and then bring up his objections.

Good: For Highlanders in mountain air, work and life; for horses and cattle and for sellers of oat meal

Bad: For those who are indoor workers, mountain and forest airless, who have a plenty of wheat food to fall back on which costs less, is far better and has been proven by long civilized and uncivilized use to be the king of grains; it is bad to use a food when better and cheaper food can be had which can be made into peerless bread, easily masticated, digested and assimilated (without gases of fermentation), that takes less force to introduce into the system and when there, gives more force to use in internal and external life.

Condition of feeders: As already seen, oat meal has been eaten successfully by the North Irish and Scotch. They thrive in spite of it. It was told in Glasgow that the weak babes died on oat meal, when the tough ones survived. This weeding process may explain the hardness of the Highlanders on oats, but it is against the political economy which strives to save all lives possible and lower the death rate of the commonwealth; as has been hinted, outdoor severe labor in mountain or forest air confers a digestive power; open-air laborers can digest oat meal, but there is evidence to show that it is a very poor food for common mankind in civilization. It takes a very strong constitution to thrive on oats.

Morphology: Common white oat: 1, cooking showed by polarizer; 2, germ like wheat only larger and frailer; 3, aleurone cells rounder than those of wheat; separate with large clear interspaces, one empty like an Arcella; 4, another aleurone set of cells, only cuboid and smaller; 5, large masses of clear protoplasm; 6, oil globules; 7, shovel shaped parenchymatous cells; 8, tegument; 9, starch grains were mostly 1-3000th inch in diameter; 10, ordinary sized starch.

Chemistry. *See* page 124. The silica is present in unusual quantities. The gluten is small as compared with wheat. Prof. J. P. Norton's analysis gives 2.24 per cent. sugar, 6.55 per cent. oil. Vogel gives 8.25 per cent. sugar and 2 per cent. oil. The decomposition of oats in the alimentary canal is largely due to silica, oil and sugar in excess; the last fermenting readily and the whole hard to assimilate. Horses and cattle contend with oats better than man. Let them have them.

Physiology: American experiments made on four men by feeding oat meal porridge, with butter, pepper and salt used as relishes resulted at the end of eight days in flatulence, constipation, windy stools.

Disease: These experiments further continued up to thirty days; the constipation, flatulence and colic were progressively increased, sore bowels, heads affected by dull and morbid dreams, ears ringing and vision defective, prickling feet and hands with later numbness and difficult walking, palpitation of heart, difficult breathing, swollen glands, fever, urine scanty and finally the constipation changed to diarrhœa. (*See* Fermentation.)

Sole food: Less than eight days physiologically, thirty days pathologically.

Manifold food: No, save with water, milk, butter and salt.

Action on blood and secretions: The sick having had the normal morphologies restored, oats will devolute it back again; oats are a predisposing cause of "colds;" they are the breaking up plow in the fallow field to make it suitable for a crop; no one sows grain on an unplowed field, so drafts of cold air on a human soil that has not been prepared by the breaking down plows of bad food, or good food, badly used, have no effect. Oats cause catarrhs of the air passages by weakening them through dyspepsia and cold air drafts do the rest. There are strong constitutions that cope with the bad effects of oats.

Cures: Not in our experience.

Head, heart, eyes, intestines: See paragraph Disease.

Hair, nails, teeth and bones: No doubt these may be good in constitutions existing in spite of oats, but man should live on account of his surroundings.

Heat: The fever noted under Disease was not healthy but due to nature's violent efforts to expel an irritating food.

Force: The experiments noted under Disease show that on the tenth day the sole oat eating men were tired and well they might have been from the alimentary canal disturbances and disease using up their force, so that they had hardly enough to run their bodies. Here is the great objection to oats; they take so much force to digest that they cannot confer force equivalent to that from wheat; it also explains the statement that the tough Scotch babes only survive. People can get force to contend with outside obstacles, but when inside obstacles are added it takes the toughest to live.

Climate: Mountain air is the only clime for oats. *Custom:* Peculiarly Scotch.

Aesthetic: Not much, for oats rarely ever figure on the menu of banquets. *Religious aspccts:* None.

Builders of tissues: In those tough enough to digest them they are good builders, but not equal to wheat.

Skin: Good, if digested.

Fermentation: Notoriously fermentative; said American experiments read as if the men were intoxicated, and had acute locomotor ataxia, another name for drunkenness.

Parasites: A dealer says that oats used for horses are usually not kiln dried, but those used for oat meal are; were it not for this latter the meal would sour.

Intemperance: Do not think that people would eat oats as rum; it has been said that the Scotch were of necessity forced to eat oats; this, if true, looks little like intemperance. Some think an abdomen full of food is a type of dietetic bliss, but the foregoing shows too much distention and disaster. Perhaps the lack of food in oats make Scotch whiskey so much prized in Scotland, and thus it tends to intemperance.

PEACH

It is largely used raw and cooked in America, where they are said to be in best perfection; the consumption is enormous; came from Persia originally and the name of the tree shows its origin, Persicum Malum, Amygdalus Persica. They are mentioned by Pliny and must have been known to the Romans. Wood and Bache say peaches are among the most grateful and wholesome of our summer fruits, and people endorse this. In the treatment of Bright's disease when the urine may have been brought to normal, peaches are allowed.

Organic: vegetable kingdom: This goes without saying.

Good: Yes. *Bad:* When eaten before or much after ripeness or if undeveloped or preyed on by parasites, or out of season. They do not keep well and are liable to decay. We write of normal peaches mostly.

Condition of eaters: Peaches agree with the normal man, also can be partaken of by the sick in moderate quantities; their beauty and blushing grace stimulates a clogged, weak or flagging appetite so that they pave the way for more solid food, which before the peaches were eaten could not be taken. They agree with all ages above the toothless babe.

Morphology: The tissues are when ripe, soft, luscious, easily separated, digestible; the seed is a large, dense cellular organ that is commonly called a stone; the cellulose tissues about the stone are dense; the substance of the peach is made up of large, irregular oblong cells of protoplasm, colored and uncolored, with spiral tissue ducts for circulation. The skin is like felt; inside dense connective fibrous tissues are found, while the outside is covered with beautiful long wooly hairs in great numbers. Between the hair bases are stomata for air circulation. There are also glands to secrete the perfume, bouquet or aroma which in a full and normally ripe peach appeals to the spirit through the organs of smell in a volatile oil comparable to the attar of roses.

Chemistry: Prussic acid is found in the kernel meat and in the leaves, flowers and bark of peach trees; the parenchyma is rich in sugar which is in the same group as liver and muscle sugar; the mineral matter is small; it is interesting in this connection that the prussic acid is not found in the peach substance eaten by man, as the same is a deadly poison.

Physiology: They are a physiological food in natural condition and dried. Physicians rarely, if ever, have cases to treat who have been made ill from eating peaches, if sound and properly eaten. They agree with the intestinal and stomachic glands when fed in season; the bowel discharges show they are easy to assimilate, leaving little débris; no substance cells to run through the bowels; in this respect they stand at the head of all food, for wheat and beef often pass through partly or not at all digested. Of course the skins, or spiral ducts and hairs go through unchanged, being made up of cellulose, which resist bowel changes and are harmless unless they enclose and envelop soluble food, so it cannot be got at in the downward peristalsis. The aromatic oil of the peach acts as a relish.

Disease: Peaches not over-eaten and sound, do not produce sickness, much less organic disease to which pathology is much restricted, but here we use it in the broad sense. They are not destructive of tissues, as conventionally used.

Sole food: We do not know. A problem for our Government specially, as it has done so much for the peach culture.

We would say that peaches could not be solely lived on long.

Manifold food: Yes, generally as dessert, but their large sale from street, railroad and fruit stands, show they are eaten much between meals as refreshment or emergency food. They are also used dried to make pies or sauce to be eaten with the more substantial bread and meat of a meal as appetizers; but usually they are eaten raw, because naturally they are soft enough for easy digestion, and cooking dissipates the perfume or natural cologne by the heat; also removes the coolness of peaches, which is so grateful during hot weather. Still we must class it as a manifold food, because while generally eaten quickly, it is ushered into the stomach with other foods.

Cures: Preserved peaches come under this head; eaten by a sick man who was progressing nicely, the next day he had a head cold, with sneezing which lasted but a short time, and disturbance of the heart at night. The sugar did this by fermenting in the bowels. They have a place in convalescence as they promote appetite and neutralize some digestive disorders. They act on the sick glands as if they were what said glands craved.*

Head: Good when eaten in season and properly; tend to sooth and satisfy the bowels and thus help the brain indirectly.

Heart: Likewise; the volatile oil and a non-volatile oil that corresponds to œnanthic ether and oil of wine, such as are found in fruit essences, strengthen the heart, as the oil of wine is a most admirable heart stimulant; it is an essential of Hoffman's Anodyne, a remedy which was gotten up before 1720, and is about the only thing that now remains of all the inventions of its inventor. Some peaches remind of the nitrite amyl used for the heart.

Eyes: Good for them as they digest well and are not too sweet.

Bone, teeth, nails and hair: Not specially good from absence of mineral salts.

Intestines: Not being very fermentative they agree well.

How often used: Throughout the season daily, unless some idiosyncrasy prevents; but not daily out of season in preserves or in cans, mainly because of the excess of cane sugar used to keep them.

Heat: Though a cooling fruit, their carbohydrates must furnish heat fortunately in small quantities.

Force: Furnish some force directly and indirectly by saving it through the digestibility. An army fed on peaches alone would not endure marches or battle long.

Climate: Peaches grow best in temperate climes. Being perishable they are consumed mostly raw and comparatively

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* Here it may be said, strong cravings of appetite (not alcoholic) must not be disregarded by medical attendants. They are sometimes nature's calls, even though unreasonable they may be. Peaches can be allowed when craved, in almost any acute diseases in moderation.

near where they grow, save when put into cold storage, fixed or moving, where they can be kept good for a long period of time. Are not a good food for cold climate.

Natural: Yes. Fortunately, customs and ethics have not crucified them to serve some whim. They are to be prized for this; foods that are natural should have the preference, other things being equal.

Aesthetics and fashions: The soft, velvety blooming peach is an emblem of peerless beauty. Here peaches trench on to the spiritual kingdom and stir the soul. There is no fashionable entertainment of the musics of the ear, eye, taste and smell in which peaches may not have a place in their season.

Religion: They are not mentioned in the Bible nor forbidden on fast days in the Latin Church.

Builders of tissue: Fat, connective, fibrous or glue tissue, but not those requiring much mineral matters.

Skin: Peaches have no effect on skin, save to keep it supplied by furnishing fat to the sebaceous follicles.

Fermentation: Peaches are perishable with decay that follows, after ripeness, in other words they rot and perish by the alcohol and vinegar yeasts.

Parasites: Yeasts and the Puccinia, a fungus which attacks the peach tree, constitute the chief vegetable hangers on. Peaches also suffer from insects as bees, hornets, wasps, and from birds as animal parasites.

Intemperance: Never heard of any one being poisoned by them. This is worth note because of the prussic acid in stone and other parts of the plant. We must qualify our statement as to peaches being wholly a natural food; peach cider in the South is largely made by cutting up the fruit and running it through a press; this cider is much sweeter than that of the apple and people easily are drunken on it; a peach brandy is distilled from peach cider, which is much more intoxicating than whiskey; peach vinegar is not so good as apple vinegar because it is too sweet; it might suit for the table but not for pickles; it is necessary to make peach cider immediately because of decay.

TOMATO

The tomato is very commonly used in the United States in their season raw and cooked; at other times canned. Tomatoes or Lycopersicum esculutum belong to the Solanum or deadly night-shade family of which Pliny mentions only the Bitter Sweet or Dulcamera. Potatoes or earth apples, as the Dutch call them, are included in this family. South America is the place of origin of the tomato, next sent to Europe during the early part of the eighteenth century, where they were introduced as "Love Apples;" they are berries corresponding to the potato berry.

Relation to mineral kingdom: Not much, as ash is in minimum.

Mental kingdom: Tomatoes are here, as their physical æsthetic beauty attracts the eye and their coolness and zest affects the mind through the palate; if they were less æsthetic they would be less eaten. The name "Love Apple" suggests it place in the mental kingdom.

Good: When used as a relish in disease or secondary food in health. *Bad:* When used intemperately or in an unhealthy condition.

Condition of feeders: The sick use them as a relish, as the sight of tomatoes may stir their souls to desire to eat; the well may use them freely.

Morphology: The substance of ripe, normal tomatoes is made up of soft intra-cellular tissue elements, so tender that they may be eaten raw like a common apple; generally there are empty cavities lined with cell substances like jelly or mother of vinegar; deeper are tough cells and fibers, while the skin is not so tough but that it can be eaten with moderate impunity.

Chemistry: United States Government report: water 94.3, protein 0.9, fat 0.4, carbohydrates 3.9, ash 0.5, calories 105; mainly carbohydrates and minerals (water).

Physiology: They digest readily and furnish anti-scorbutic matter to prevent scurvy, but their main use is a relish and to give an æsthetic setting to the table and the eye.

Disease: It has been claimed in England that the increase of cancer was caused by eating tomatoes raw and canned; this is not the experience in America; taking the definition that cancer is "tissue under mob law" there might be some foundation for this statement, for if the tissues are not under the unwritten law of our constitutions that makes us develop normally, then we must expect abnormal development or death and the tissues developed out of place and proportion as found in cancer; the multiple form of cancer elements show that its tissues are like mobs in the body politic; if people lived on tomatoes largely we should expect disease of the tissues, because tomatoes have not food elements enough to maintain the body in health, but we should not single out tomatoes above other relish foods, for we should consider that asparagus fed solely would cause cancer or some other disease of tissue substance in a few months. But if tomatoes are used as a relish they would not so impoverish the biological powers of the body systemic as to allow their charges to rule over them as in a mob. When we consider that cancer was known to the ancients and treated of by Hippocrates, Galen, Paulus Ægineta, Cullen, Pearson and others, thus prevalent long before tomatoes were eaten, it is rather late in the day to single them out as its chief cause in England, any more than as we have suggested.

Sole food: We know of no experiment; probably not longer than ten days.

Multiple food: Tomatoes are for the main part eaten alone raw with pepper, vinegar, salt and oil; they are also cooked, usually in water and flavored with butter, etc. Tomato soup is made of stewed tomatoes in clear beef stock. Tomato sauce or ketchup or catsup is a relish mixed with spices, originally an East India pickle. South Sea Island cannibals used to eat them with human flesh. They are generally used in connection with other foods, so they are sure to be manifold when in the stomach.

Cures: Only as a relish or as anti-scorbutic in scurvy and hemorrhagica purpurea.

Head: Hardly, save as a relish to stimulate the appetite and desire for food. Not much nerve food in them beyond this.

Heart: Not hearty, save in a spiritual point of view through the eye and palate; still their absence of easy fermentation makes them a desirable relish in heart diseases which are better treated the less gas there is in the alimentary canal.

Eyes, bone, teeth, nail, hair: No, have not mineral elements enough for good work here.

Intestines: On the whole good, as they do not ferment readily.

Heat: Abound in heat, though not enough for cold weather.

Force: No, save as a relish, causing to "lick again" force conferring food.

Climate: Hot and temperate climes are the places for tomatoes, save as catsup.

Natural: Custom has not decreed tomatoes to be deprived of some of their most important constituents.

Aesthetics and fashion: Their redness is very beautiful, as whiteness is with flowers; the fashionable menus include tomatoes; their decided color makes a fine contrast to the whiteness of the table linen and silver. There are white tomatoes which contrast well with other foods, but they are rare.

Religion: Not mentioned in the Bible, nor are they tabooed by any religion as far as known.

Fermentation: Tomatoes are not bad fermenters in the alimentary canal. The digestive organs are generally able to cope with them and they are not so often as other foods left to be preyed on by the alcohol and vinegar yeasts. It is probable also that tomatoes exosmose through the walls of mouth, gullet and stomach so readily that there is not much of them left to be digested in the intestines.

Parasites: Animal parasites: (1) fruit worm, bole worm; (2) tomato sphinx, five spotted hawk moth (Protoparce celeus); (3) its larvæ tomato worm that devours the foliage; (4) another tomato worm like (3). As to vegetable parasites, tomatoes resist them until they are over-ripe, thus exemplifying the general law of death dealing vegetable parasites the vitality of whose hosts must be lowered ere they can be preyed on.

Intemperance: Never knew of a case with tomatoes either in eating or in intestinal brewing of alcohol. Relishes are not apt to be used intemperately, as they cloy and clog the appetite.

PRUNE—PLUM

Plums dried are prunes. They are mentioned by Virgil. Come from Asia Minor it is said; in modern times from the south of France; but now better prunes are from California, where they are cured by the climate. In France, prunes are partly dried by artificial heat, completed by the air. Are extensively used as food. The undried or raw plums are much eaten in their season. On the east coast of New England there are many beach plums, small and rather bitter, which are used for sauce. There are over three hundred varieties of plums. Are used for the confection of senna. (United States Pharmacopœia.)

Vegetable kingdom: Grow wild on small trees, also much cultivated.

Mental kingdom: Possibly as relishes stimulating desire for food, being "very fair to look upon."

Good: In their place. *Bad:* If abused.

Condition of feeders: Feeble people who need appetite stimulated; convalescents; those who seek confections. They come in well in cases of chronic diseases where there is constipation and when the patient has gotten over the worst stages. It is one of the first vegetable foods after a strict animal food diet.

Morphology: The substance or parenchyma is loose, luscious and easily broken down; large oval cells with clean walls inside, from which comes a clear protoplasm, with centrally amœboid granulated protoplasm stretched like a big spider with legs or processes touching the concavity of the periphery with amœbic irregularity, and if you take the right stage of ripeness, manifesting most admirably the automobile movements of active protoplasm, equal to, if not excelling those of the protoplasmic cells of watermelon. There are connective fibrous tissues and spiral cellulose ducts. The pit or stone is made of dense woody tissue, like but not so hard or pitted as peach stones. The meat tastes of prussic acid and is not used. Plums are not very sweet.

Chemistry: Uncrystallizable sugar (glucose), malic acid, which gives the sourish taste and mucilaginous matter; crystallizable sugar has been obtained from prunes equal to cane sugar. *See* page 124.

Prunelles and prunellas. One is a small French plum and the other a superior French plum, whence the stone and skin have been removed.

Physiology: Laxative and nutritious; easy to digest anatomically and chemically; mild in action and hence grateful to the moderately ill or sick.

Disease: If too largely taken in a debilitated state of the digestive organs, they cause flatus and griping in stomach and bowels; are not destructive of tissue, but if too long used might produce enlargement and thickening of the bowel walls and colloid or gluey discharges from the intestinal glands. With common sense this can be avoided.

Sole food: Not long probably, as they will purge and have not elements enough to sustain life normally.

Multiple food: Prunes and plums are used as desserts and hence even if eaten alone are mixed with other foods. Prunes are generally cooked with water and sugar and used as sauce. The California prunes are sweet enough without sugar and are more nutritious. Plum broth contains plums and raisins; plum cake has no plums but raisins and dried currants; plum pudding is made of flour, suet, raisins, currants, spice and spirits; plum pies first of plums, second of raisins and currants. Plum porridge is made by mixing raisins, currants or plums with flour.

Cures: Not directly but indirectly by satisfying the cravings for botanic food in patients who ought not to eat it liberally. It is a safe food to venture on and being separated, that is in small bodies about an inch long, they can be counted off by numbers, *i.e.,* four to six prunes being often all the sick can bear. If more the disturbance comes.

Head: Not much, save as stimulating the soul to desire food.

Heart: Taken moderately, yes; immoderately, no; this because of flatus.

Eyes, bone, teeth, nails, hair and muscles: Mineral elements not sufficient.

How often used: As a relish they can be used a long time satisfactorily.

Heat: We have never known prunes to be used to make the body hot; the purpose has been to cool. In Arctic zones if they could be had it is very doubtful if prunes would replace train oil or fat meat as heat producers.

Force: No relish has much force which includes much more than heat. Like tomatoes, we have known plums so plenty as not to pay for gathering to be used as farm laborers' food. They might do for herbivora.

Climate: Warm and temperate.

Natural: Prunes lose the pits and may lose the skins, but the interstitial and interhistological water is the real loss, and this may be deemed natural (as in California). Plums are a natural food having no artificial admixtion.

Aesthetic and fashionable: Plums are damask blue, green, white, and their bloom is fully up to the æsthetics of the eye and stir up the soul to zest for eating. Plums set off a table in good form. In their season, plums will grace the most fashionable banquet.

Religion: No connection.

Skin: Healthy.

Fermentation: In Germany there is obtained a kind of brandy which in some districts is largely consumed. Of course no gas can come from eating plums and prunes save from the fermentation, but the above instances are not common because of the sparing use. They are rather to be commended for their general freedom from fermentation in proper use.

Parasites: Plums are subject to the vegetations of decay after ripeness; before ripeness they may be affected by a fungus; the plum curculia (Conotrachelus-nenuphas), an American wevil; a beetle of the family that also preys on the apple and quince; the wevil anthonomus prunicida or "plum gouger" is highly destructive to trees in the Mississippi Valley; plowrightea morbosa is the fungus that produces prune knot; plum moth (Grapolitha prunivora) injures plums.

LEMON

The lemon is classed among food relishes; comes from Asia and is a tropical and subtropical fruit of the aurantiæ or orange family; the citra medica. There are three kinds: 1, *citron;* 2, *lemon;* 3, *lime.* 1, Citra medica of Risso, fruit large, sometimes six inches long. The inner skin is white, very thick and spongy; nine or ten compartments filled with oblong vesicles contain juice the same as lemon juice. 2, Citra medica of Linnæus is the common lemon. 3, Limes or Citra æris of Miller; juice very acid; useful for all purposes of lemons. According to Risso and Porter there are 169 varieties: heads as follows—1, sweet orange; 2, bitter and sour oranges; 3, bergamots; 4, limes; 5, shaddocks; 6, lumes; 7, lemons, and 8, citrons. 5, Shaddock citrus de cumana, so called because brought to America by Captain Shaddock (Standard Dictionary), are sometimes eight inches in diameter and are much in demand as grape fruit. They are not a food but a physic.

Lemons go back in history to the second century, and if Tappuah, as some say, is the same as citron, the lemon was well known before 1450 B.C. Pliny mentions them.

Vegetable kingdom: Yes. *Mental kingdom:* Yes, as a stimulant to the mind.

Good: Yes. *Bad:* Rarely; we have given harmlessly a pint and a half of lemon juice in one day; they disagree rarely in certain people.

Condition of feeders: Lemons may be given to all ages, even babes, and are rarely prohibited in disease.

Morphology: The orange family are all remarkable for the size of the ultimate cells of the inner structure, which probably are the largest in the animal or vegetable kingdom; they are easily visible to the naked eye and separable into single massive cells of protoplasm. The lemon pulp is easy to separate into eight wedges with straight edges but rounded at the back; so are oranges. The structure is loose, the fibrous tissue is weak but stronger in lemons than in oranges; further studied is found to be very delicate and transparent. The juice of the lemon contains free oil in drops and amœboid masses; minute particles, possibly oil in division; very delicate substance cells; crystals of raphides (consolidated into masses like cystine) which polarize light; while the fibrous tissues do not. The lemon is a good organ to study tissues on. Usually the juice alone is taken and the fibrous tissues rejected in diet.

Chemistry: United States Government report: refuse 30, water 62.5, protein 0.7, fat 0.5, carbohydrates 5.9, ash 0.4, calories 145. Lemons contain six to eight per cent. citric acid; four grammes in a large lemon; other constituents: gum and sugar 1, potassium 44.34, lime 7.61, phosphoric acid 7.56 per cent. Dr. Austin Holden. The free oil gives flavor. The rind is full of aromatic oil.

Physiology: Refrigerant, making an agreeable and refreshing beverage in lemonade, lemon juice, sugar and water. Used as a remedy in rheumatism, especially cystinic variety. In some forms of rheumatism, not cystinic, lemon juice accentuates the disease, thus emphasizing the value of the microscope in blood morphology. (*See* Beef and Uric

Acid.) Lemon juice is a cure for oxaluria; is also good for biliousness. It is remarkable that of all vegetables in disease it is the best borne. This age is fortunate in being so well supplied with lemons.

Sole food: The citric acid, its chief constituent, could sustain life but for a limited time.

Multiple food: Necessarily yes, as they are relishes and well named, because the juice from the lemon makes one not only "lick again" but many times.

Disease: Does not produce as a rule except in certain ropy conditions of the blood.

Cures: It aids in helping to get down food in difficult cases when the patient turns against it and has to fight to live; is anti-scorbutic; also see Physiology.

Head and heart: Good only in awakening feeling for food and in relieving the blood of oxalate of lime and cystinic rheumatism. The more crystals in the blood stream the more difficult it is for the blood to flow and hence harder for the heart and the easier for diseases of function and tissue to occur.

Eyes: Not much, save in clearing the blood stream from crystalline bodies, which by their retarding or impeding the circulation of the eye renders its fatty degeneration more possible.

Bone, teeth, nails, hair, muscles: It is not a builder of such tissues.

Intestines: Good, by stirring up the liver and keeping it at its work, also for the prevention of scurvy; lemon juice is a great anti-scorbutic.

How often used: Lemon juice can be used at and between meals without harm.

Heat: Not much in lemons, as they are refrigerant and cooling.

Force: Lemons by their cooling properties on a hot day may increase force, but otherwise they are not good save as preventing the waste caused by a dull liver or rheumatism.

Climate: Lemons best in hot and temperate climes.

Natural: Usually eaten without any ethical detractions.

Aesthetic and fashionable: Very; lemons have a place at banquets and clubs.

Religion: Noted favorably in the Bible.

Skin: Nothing special known.

Fermentation: Ferment but little in the alimentary canal. This is the reason they thus excel; common vinegar used as an acid on spinach, does not always agree, while lemon juice almost invariably does and should be substituted where vinegar disagrees; there is a cleanliness of taste compared to that of ordinary cider vinegar; besides, lemon juice as it is used can have but little yeast in it, while vinegar has both alcohol and vinegar yeast to add to the plants already in the alimentary canal. It is a very interesting fact that citric acid has such qualities over the acetic acid of vinegar. Citric acid is not a product of destructive fermentation, but is a physiological formation.

Parasites: Lemons decay after over ripeness, but we find no mention of other parasites upon them.

Intemperance: Not known with lemons. Lemonade is a temperance beverage.

LIMES

Have the same uses as lemons. They are also put up in brine and thus have an earthy taste.

ORANGE

Chemistry: Principally sweet and sugary. United States Government analysis—edible portion: water 87.5, protein 0.8, fat .1, carbohydrates 11.1, ash .5, calories 225.

Much used as wholesome relish food; one orange is allowed in Bright's disease when cases are improving, but the objection is they are too sugary and will put vinegar yeast in the blood after it has been removed, etc.; a man and wife visited the Windward Islands and lived on oranges largely; both came home ill and the blood showed the mycoderma aceti in abundance. Their use should be restricted mainly to well people as a dessert and refreshment, especially in warm weather. Orangeade made of oranges, sugar and water is a pleasant drink, but not so satisfying a beverage as lemonade. How much must we admire the admirable chemistry of the orange to be so much alike, yet so much different from the lemon.

Parasites: Icerya parchasi or scale insect; the orange dog or caterpillar of the butterfly, papillo cresphontes, extremely injurious in the south; orange mite, tyro glyphus gloveri; also the yeast plants of decay after full ripeness as in all sugary fruits, save dates.

GREEN PEA

Pisum sativum: Ranks next to bread, rice, wheaten grits, hominy, sago and tapioca; known to the Romans, Columnella Lucius, J. M., agricultural writer about A.D. 45. In Darwin's Zoonomia, the pea ranks high; wheat, barley, oats, peas is the order given; animal foods are in the first great division; botanic foods in the next; air comes low down in the fourth division in total of six. Parr criticises Darwin's order by saying that he neglects the obvious distinction between the degree of nutrition and the facility of digestion; these remarks are specially good in 1906; the world groans and dies for not recognizing this knowledge; it is fooled by the sense of the beautiful in food (sight, smell and taste), regardless of physiology and pathology.

Mental kingdom: Yes. *Good:* Yes, very good. *Bad:* Green peas when properly prepared are not bad. Dried peas we have known to poison a whole family. Another almost inexplicable circumstance is the following: Father and mother with grown-up children kept continually vomiting despite the remedies administered; emetics were then advised and have it over with; these given and the vomiting ceased. We must remember in this case the peas were dried, not green; examination did not bring any satisfactory proof of cause. Stale green peas are not so good as fresh, for they wilt and lose crispness and a fine albuminous odor, which is volatile and dissipates by keeping. Canned peas are now in the market and largely used; of late years, they have been found quite good and taste and chew like fresh peas; if they were steamed and canned in the field immediately after picking, they would be much better.

Condition of feeders: Green peas prepared and served normally suit all that have cut their teeth; we have never known them to disagree.

Morphology: Peas belong to the leguminosæ or bean family. The common pisum sativum is covered with a membrane made up of loosely joined pillars of cellulose (standing at right angles with the plane of the said membrane), which are as thick as the pillars are long; being so loosely and fragilly put together this membrane easily softens and disintegrates by the action of heat in cooking and is one of the most important changes made in the kitchen, for thus is removed the barrier against the contact of the digestive juices to the inner substance of the peas, which also undergo great changes in the cuisine. A section of green pea substance gives a beautiful network of woven connective, straight fibrous tissue; the spaces thus formed are filled with starch grains; but boil or steam green peas and you find said network changed into ovoid, obovoid, oblong and sometimes globar cells of cellulose, containing when fully cooked, starch grains all broken up and changed into a homogeneous granular mass like mud almost and the walls of cellulose generally ruptured, thus pouring forth their contents for easy access of digestive fluids. Again, these fully cooked starch grains do not polarize light. If the cooking is incomplete the grains which retain their shapes like eggs in a glass globe will partially polarize light, for the cellulose walls are transparent like clear glass. Now, raw pea starch polarizes light much. Taking this as a standard say ten and the cooked grains not polarizing light as zero there is had a gauge for the amount of cooking. Half cooked starch grains would stand at five and thus is added to our kitchens one of the finest instruments of precision (polariscope) that brings out vibrations of color nine hundred and twenty millions of millions per second. Surely this is an æsthetic worthy of commendation to the kings (chefs) and queens of the kitchen. (*See* The Changes in Food by Cooking.)

Chemistry: See page 124.

Physiological food: Very much so.

Disease: Green peas properly cooked are not pathological. *Destroy tissues:* No.

Sole food: They come high, next to potatoes, seventh on the list, and they can therefore be lived on from thirty to forty days.

Manifold food: Green peas are usually eaten as a vegetable dish; not a relish but as a nice combination with animal foods. Pea soups are made by boiling in water with or without meat with seasoning and sometimes thickening.

Cures: Only as a convalescent food.

Head and heart food: Yes, in a secondary way.

Eyes, bone, teeth, nail and hair: Not specially good, but good enough to tide over emergencies.

Intestines: Will cause distention of bowels when solely fed on.

How often used: Can be fed on through their season with other foods.

Heat: Not great in green peas but enough for hot weather, the time of their greatest use. Dried peas are used in soups in cold weather, but as the soups are hot, the heat is largely in the hot water.

Force: The experiments on sole green pea eaters were in laborers on a farm who worked hard all day. Again they could not be lived on as sole food for thirty days unless they had force; still the eaters in question outside of appetite, were very glad to get other food at the end of the experiment.

Climate: Temperate climes are for green peas.

Customs: Green peas and steamed salmon are a great standard dinner for Fourth of July celebrations in America. They have a place on the table of the poor and rich acceptable every where.

Fashions: Fashions have let alone green peas; they are eaten as they grow, save for the softening by cooking and the abstraction of their soluble mineral salts in the liquor which is always served with the peas on a deep plate. (*Some* people soak dried peas and bake them as they do beans and *say* they are as good as the green pea.) Green peas served on silver platters are very æsthetic to the eye and stimulate the desire to eat them.

Religion: They are not mentioned in the Bible but are allowed on fast days in the Latin Church.

Builders of tissues: The said green pea eaters kept their fat and must have had new tissues laid down.

Effect on skin: Fed exclusively to colored people, a very perceptible ashy white skin was produced.

Fermentation: There is such; see Intestines. The gases produced are carbonic and sulphydric, also the customary alcohol.

Parasites: Bugs like terrapin in Virginia, caterpillars, blight, pea beetle or wevil Bruchus pisi, pea maggot, pea moth, sebrasia nebritana. Green peas decay with yeast, but dried peas keep for years.

Intemperance: Very rare; they do not promote the idea of surfeiting; being green they have no alcohol.

BAKED BEAN

As food, has been extensively used for years; fed King David and troops 1023 B.C.; Pliny and Columnella mention beans as in use by the Romans. They belong to the family Leguminosæ, Phaseolus vulgaris. The name Phaseolus or Faseolus is Greek. The story of beans is so great that it is hardly possible to do it justice in this work. The bean family belongs to a vast order of many petaled herbs, shrubs and trees. It has three well-marked sub-orders, twenty-four tribes, four hundred and twenty-seven genera and seven thousand species. We must therefore confine ourselves to the typical Boston White Bean used in New England as the conventional meal for Saturday night and Sunday morning. When beans are mentioned here the said small white bean is meant unless otherwise stated.

Mental kingdom: Experiments on six healthy men by sole feeding, in five days, found them to be bewildered, confused and dizzy, and on the fourteenth day the following conditions: head vacant, numb, dizzy, strange, eyes staring, ears ringing, unsteady gait, reel in walking, felt as if drunk.

Good: Doubtful for our type of humanity with such a history; but there may be and probably are in the seven thousand species of beans some that are good in that their physical elements do not resist digestion like the Boston white bean.

Bad: Because their tissues resist the powers of digestion and assimilation and thus become sources of evil if detained in the alimentary canal. The trouble with beans is in their connective tissues, which make the stony hardness of the raw bean; the digestible bean starch is enveloped in said indigestible connective tissue or cellulose. More of this further on.

Condition of feeders: This makes a great difference. Lumbermen winter in the forests, eating baked beans sent to them by the barrel, which are cooked before going into camp, freeze solid and have to be chopped out with axes as if they were trees and cooked again. But the pure forest air and very active and severe physical labors which promote downward peristalsis serve to protect those bean eaters from harm. Once at Concord, Massachusetts, State Prison on a visit, the senior writer saw in the latrines, which were large open-air brick walled and bottomed cells, at least a cartload of baked beans, all apparently undigested, that had run the gauntlet of the convicts' alimentary canals. It was a good physiology thus to get rid of such intruders, but what a punishment was it to make prisoners eat such articles of food. People must be tough like the Scotch on oat meal to live in spite of the beans. It would be much better for New Englanders to eat baked beans after the rest of the Sabbath day than after the wear and tear of six days of hard work. As a matter of history beans are eaten by all ages and conditions save the sick.

Morphology: Is the same as for peas, only that our typical bean used so much for baking is denser and heavier; the straight connective fibrous tissues in the cross sections of the raw bean are heavier and the sacs of starch brought out by cooking have a tougher, denser coat than the pea; the investing membrane of the bean has prisms whose long sides are straight and fit closely to their neighbors, making a stronger fabric than the pea; they appear as the basalt prisms of the Giant's Causeway in Ireland.

Chemistry: See also page 124. Beans have more ash than wheat, rye, barley, rice unhusked and peas, so that they are a fine food chemically to make bones, but the structure stands in the way of physiological eminence as a food; there is a larger proportion of nitrogen in beans than in any other vegetable food.

Physiology: To have the physiological action of the bean it must be thoroughly cooked. It must be soaked (best in cold water over night) boiled for twelve hours and baked during the night, so that the starch is thoroughly changed into a homogeneous granular non-polarizing mass. The sacs must be ruptured so as to allow the free access of the oral, stomachic and intestinal juices of digestion to the starch, also to rupture the outside tough Giant's Causeway prismed outer envelope; thus the physical obstacles are removed which otherwise more or less bar out the nutritious chemical qualities of the bean; but the difficulty is that people do not take the pains to cook the bean so as to present the test of full cooking; they are satisfied with the halfway cuisine, that leaves the outer envelope unbroken, the starch sacs unruptured and the starch grains to preserve their shapes like eggs inside a big glass globe and to polarize light. The beans noted (under Condition of Feeders) had been through the alimentary canals of the convicts untroubled and had been nothing but objects of intestinal irritation; also the morphology of the baked beans of commerce proves this by showing the unruptured sacs and the polarizing starch grains; indeed the writers have rarely, if ever, found perfectly cooked baked beans, so practically we must say that the physiological action of baked beans is an exception than a rule.

Action of the ordinary baked beans: Six strong and well men were fed on a diet of baked beans and coffee with the following histories: "Third day bloated, constipated, colic, ears ringing, dizzy. Fourth day, also bewildered. These symptoms increased so that by the ninth day, hands, feet and body prickled. On the eleventh day bewilderment much greater, other symptoms further accentuated, constipation succeeded by diarrhœa. Eighteenth day very much worse, including dragging feet, much dizziness, ringing of ears, palpitation of heart, prickling, numbness all over, reeling and difficult walking. (*See* The Relation of Alimentation and Disease.) These experiments throw light on what the general practitioner meets with often and perhaps are not sufficiently appreciated. Hence when people complain of the following symptoms, to wit, bewilderment, dizziness, confusion, ears ringing, profuse diarrhœa, difficult breathing, exhaustion, eyes vacant and staring, feet dragging, palpitation, pain in heart, prickling limbs, reeling, strange feelings, walk reeling and unsteady, weakness, wobbling, their relations to disease of the nervous system should be remembered. It is well not to forget that four days feeding on broiled beef cured said cases; such has special significance as to the treatment of locomotor ataxia. *The conventional baked bean,* solely fed, may be considered as destructive of the spinal and ganglionic nerve centers.

Sole food: Eighteen days.

Manifold food: Practically; salt pork and molasses are usually baked with them. Bread, butter, pickles and tomato catsup are almost always presented on the table with them.

May not beans be used without producing disease: Most all bean eaters* say they can. It is human not to own up to error, especially in relation to foods, but in view of the facts here given, the beans should be thoroughly cooked; after this they should be the food of active out-of-door workers, mainly. It would also be better to give up the use of the white pea bean conventionally used by the mass of the people, and use the larger beans. The Lima or Siva has a less compact outside skin, its prisms are loosely put together, the sacs of cellulose, incorrectly called legumen, are thin and more fragile than the sac cells of the conventional bean. The morphology of the seven thousand species of bean should be studied to find what species is most readily softened or separated so as to yield its rich store of nitrogen to the actions of the digestive organs.

Morphology of the large red bean: So far as examined it is not, as to skin, made of cellulose prisms and hence it is easier to cook and digest; it has a food claim over the conventional bean.

Cures: Not much unless properly cooked so that the nitrogen and other mineral elements can be assimilated. Under such requirements no doubt beans can help to cure broken bones; but under such conditions we are confronted by the non-locomotive state of the patient. It is better to cook beans so that disease may be cured by preventing it.

Head: Based on the evidence here given they are considered a bad head food. Epileptics will have fits brought on by feeding on them; also the conventional baked beans are so hard to digest that they steal away force from the head. The action of fermentation paralyzes the brain more

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* A Boston dealer, 1901, whose business embraces one million bushels of beans per year says that lately they were obliged to import bags of the conventional bean by the thousand from Europe to supply the present demands, as the domestic crop is not sufficient.

or less, thus the head has a hard time with common baked beans. We especially would not recommend baked beans to literary people.

Heart: In the sole feeding of beans, the heart palpitated and was oppressed. This came from the paralyzing gases in the bowels, also because the heart's force was lessened by the extra work of digesting the beans. The local heart circulation must have been impeded and retarded, its nourishment lessened, when to do its work in a system overborne with too great digestive labors the heart should have had more. No doubt in beans properly cooked, the nitrogen assimilated would make a fine heart food.

Eyes: In the above experiments, the eyes suffered as to osmotic circulation being impeded or hindered by the troubles wrought by said beans. Chemically beans should be good eye food because the cornea and lenses demand plenty of mineral elements for their proper development.

Bone, teeth, nails and hair: Beans are fine foods for these organs if their mineral elements can be assimilated. Plenty of hot water should be given to cases bed-ridden because of fractures and thus help the digestive organs by keeping the beans moving downward.

How often used: Three days with safety under normal conditions. The case for New England would be far worse if baked beans were used daily.

Intestines: Baked beans bloat them by the gases of decomposition from the starch fermenting inside of the unruptured sacs and exploding them like dynamite bombs.

Heat: Beans have heat abundantly from their starch, but due to the present usages of imperfect cooking the heat is largely lost, as the starch is not all digested.

Force: The subject ranges in two ways—one to digest beans and the other in its production. The average bean eater must expect to expend much more force in digesting beans than he should, simply from the brainlessness of the cooks; better for him to spend a part of his force to make the kitchen do its work; if beans are properly selected and thoroughly cooked, their assimilable nitrogen and mineral elements will confer force, as seen in the severe labor of the lumbermen.

Climate: In temperate and cool climes, beans are best. Dried they will keep good for four or five years; they are used all over the United States.

Natural: Custom has not decreed any diminution of the natural condition of the bean; its skin and substance are kept intact; its chemistry is unaltered to suit the demands of society table ethics.

Fashionable: Not specially, though they figure on menus to some extent. Beans are rather the food of the poor and what is called the middle classes. The élite prefer in Europe to give them to their horses. The élite of 1800 B.C. must have deemed beans a very æsthetic dish, for it was of lentiles that Jacob made pottage and bought Esau's birthright with it. Times have changed since then. No New Englander would give a fashionable banquet to an Imperial Representative—of baked beans. No, they are rather a homely domestic unæsthetic dish to set before one's guestless family.

Religion: While Esau's pottage affected the world's religions by his disposing of his birthright, still beans do not figure now in the religions of the world unless in the deranging of the heads of religionists, stirring up strifes because of the bewildered cerebration, making people cross, crabbed, ugly, cruel, of a sour disposition, obstinate, etc. Had New Englanders ate the right kind of properly cooked baked beans, perhaps there would not have been so much theological antagonisms in that favored land.

Builders of tissue: Fine, *if* they can be assimilated.

Skin: So far as known they confer strength on it and cause no skin disease other than if one has latent eczema or other skin disease and with difficulty digests beans or other foods, the said eczema will begin to show. The best skin disease treatment is to keep up a normal nutrition of the body and stop the leaks of force.

Fermentation: Yes, as already daily shown; see also chapter on Fermentation.

Parasites: (1) Bean dolphin an aphid; (2) bean wevil, Bruchus fabæ of America; (3) a mould in wet weather will attack beans, Ustilago; (4) smuts uredinæ, etc. The white pea bean has been wonderfully protected by its tough cellulose envelope, which preserves the bean from the attacks of these parasites, or if they are attacked, the change of color reveals at once a warning and besides, the severe cooking will destroy all fungi, which probably would not find a nest on the vines, if they are properly manured or fed.

Intemperance: The only fatality we know of was in 1854, when the Asiatic cholera killed two cases in a Massachusetts town. One was an Irishman who had eaten improperly (not wholly of beans however) and the other was that of an estimable and respected physician, some sixty years of age, who had all the symptoms of cholera exhibited in his vomit, and in addition baked beans, some of them black and brown, but all hard and some chitinous. It was intemperate for him to have eat the clearly improperly cooked baked beans, and had he not thus predisposed his intestines to the complaint which was thought to be "in the air" of the whole country, he would not have lost his normal force and thus died of cholera. But we may go back of this and arraign the cook for her shabby, slatternly, inexcusable work, as there should have been water enough to keep the beans from burning. The incident serves to show how much our lives depend on the queens of the kitchen.

STRING BEANS

The unripe pod and contents are here considered and are ranked with green peas freshly picked, next to the seven aristocratic and royal vegetable foods.

Mental kingdom: Yes, as they are so easily digested and their nutritious properties so readily assimilated when freshly cooked.

Good: When freshly cooked they have a velvety crisp fresh water sponge feel and are good.

Bad: If wilted, limp and not crisp; they do not, however, deteriorate very fast, but the closer they are used to the time of picking the better they are. They are like green corn (maize) in this respect. The wilting is due to the evaporation of the water of cell life which to them is like the water of crystallization to mineral substances and more. Wilting is an arrest of growth and osmotic development.

Condition of feeders: Fresh string beans are adapted to most convalescents and well people when properly cooked.

Morphology: The seeds are undeveloped, small, fragile and easy to separate; the tissue of the pod is elastic, separable, protoplastic, soluble—soft, though not a jelly; fine things to study microscopically because so easily reduced to a thinness that allows light to penetrate through and reveal their structure, which is beautiful (when uncooked) under polarized light; the specimen studied, March, 1902, canned goods, was a rarely rich object; this is saying a good deal.

Chemistry: United States Government report: refuse 7.0, water 83., protein 2.1, fat 0.3, carbohydrates 6.9, ash 0.7, calories 180. It is probable that the mineral elements in ripe beans are present in string beans in an assimilable and easily digestible form, because nascent.

Physiology: The flesh of string beans is being developed and is unprepared for the functions of resistance to outside causes of decay like the bean itself. Again the mature bean pod is so indigestible as not to be eaten unless hunger can in no other way be satisfied, and even then it would give the digestive organs, weakened by famine, such a hard task that the said mature bean pods would be almost poisonous. String beans thus add the succulent and nutritious pod envelope to the food values of the seed bean and need no soaking, as they have water enough, which is essential to their nutritive qualities as shown by the ill effects of wilted string beans. So the physiology of string beans is all in the direction of normal assimilation in man, and if they have as much nitrogen and mineral elements as the ripe bean their use is to be encouraged.

Disease: There is none for fresh string beans, properly cooked, but if used wilted they do not digest well and may cause all the ills of indigestible vegetable food of a milder type than the woes of indigestible baked beans; when the nascent development has come to the stringy or fibrous tissue states, or in other words when the connective fibrous tissue cells have passed their protoplasmic stage, they are unhealthy.

Destruction of tissues: Fortunately people are wise enough not to eat stale string beans and hence practical instances of this are not known. String beans show a different mode of development from apples, pears, potatoes, cranberries, oranges, bananas, thus demonstrating unity and not uniformity in the natural world. The natural philosopher basing his observations on string beans might make a law that connective fibrous tissues were first soft and tender and then dense and hard, but every boy who samples green apples knows that said tissues are hard and indigestible and that the ripe tissues are soft. In the animal kingdom taking man as its highest type an observer might reason that man's red blood corpuscles should be smaller than those of the whale and larger than those of the frog, whereas, the whale's red corpuscles are half man's size and the frog's several times larger. Again, as man's white blood corpuscles are larger than the red it should be so, as to other animals; it is, but not in all; the white blood corpuscles (leucocytes) of the frog are smaller than the red, and the examination of the blood of the living frog spleen shows the red corpuscles forming over the white, yet they are all bloods and the same though not uniform. Man then should be very careful how he undertakes to formulate the laws of creation.

Sole food: They come next to potatoes.

Manifold food: Always eaten in connection with other foods, but are generally served by themselves.

Raw: Not as a rule, as they produce disease; tender though they are, they must be boiled in water or steamed. If man was brought up after weaning to live on raw foods, string beans probably could be eaten, certainly better than raw bean seeds or berries.

Cures: During convalescing any vegetable food that can be lived on for thirty-four days solely is generally good to complete their cure.

Head: Yes, or else sole feeding for thirty-four days would not be healthy, which word here includes the health of the head—intellect. String beans would be good in the diet of literary men, college students for example. Its large excess of nitrogen must confer force on the ganglionic nerve centers, especially as their digestion is so easy. Well might New Englanders exchange their ill-cooked conventional baked beans and show to the world even better head work than they have surprised mankind with.

Heart: Is good for the nitrogen reason.

Eyes, bone, teeth, nails, hair: Good because of soluble mineral elements.

How often used: Mainly in summer and fall months. Are used in winter canned.

Intestines: String beans do not distend, thicken, or irritate the intestines like baked beans. This is a point of great dietetic value.

Heat units: The starch and connective tissue of string beans furnish plenty of heat.

Force: Theoretically, string beans because of their nitrogen furnish much force; practically a woman who lived on them for a day solely, states that she was abundantly able to do her manual work and felt no loss of potential energy; the same was the case of the men who fed solely on them for thirty-four days.

Climate: Best in cold and temperate climes.

Natural: Customs do not deprive them of their nutritious elements.

Aesthetics: Fashion admits string beans to its menus freely. It is to be hoped that string beans will continue to hold their high place in the estimation of those who cater for the well-to-do. The present mortality of this class would, we think, be lessened if string beans were more freely eaten in place of many good looking and good tasting articles which have no other qualifications for their use.

Builders of tissue: Surely. *Effect on skin:* Good.

Fermentation: Fresh, healthy, properly cooked and eaten string beans do not ferment in the elementary canal like baked beans.

IRISH MOSS

One of the algae, Chondrus crispus. Fucus crispus, United States (Dunglison), who says it is a good diet for consumptives; in Ireland the sole food of the very poor. It grows on the New England seashore, where the ice water of the gulf stream comes on its return after leaving the arctic icebergs. At Buzzards Bay where water in summer is about 70 degrees Fahrenheit Irish moss is not found; is used as dessert in the United States.

Algae are aquatic and marine plants with and without roots and without trunk, bark, leaves, etc; they have over two hundred thousand species; are called cryptogams, because they have no flowers (as the phanerogams have), but propagate by spores and by budding. Are smaller than the smallest phanerogams and larger than the largest. Common hydrant waters furnish algæ invisible for study save with a microscope power of four hundred diameters; the macrocystis pyrifera of the Sargasso Sea is a free floating alga, one-third of a mile square and nine hundred feet deep (Prof. Paulus F. Reinsch), and yet these two are of the same family. *Fungi are cryptogams* and they differ from algæ, mainly as animals from trees. Fungi and animals give off carbonic acid gas; algæ and trees give off oxygen and thus vivify the air and seas for animal life that would otherwise perish. *Algae* are called Thallophytes or frond plants, and are used as food; not at all in comparison with the flowering plants. It is probable that man could find in algæ large and good additions to his food supplies, hence it is a field to be occupied, but the Irish moss is the best known and most used at present.

History of Irish moss: References found do not go back of the last century, but perhaps under another name it goes further.

Good: Yes. *Bad:* Not when properly prepared.

Condition of feeders: Chronic diarrhœa cases, consumptives, delicate persons best suited to it.

Morphology: The fronds are boneless, semi-solid, tough, leathery, somewhat elastic, branching in double divisions, interspace between flat surfaces filled with a gelatinous protoplasm. There are no woody fibres nor spiral tissues, no vessels, no cellulose nor bark nor roots for nourishment, but simply as anchors to stones and other objects so closely attached as to be detached with difficulty. Color is purple when fresh, but dried it is yellow or yellowish white with sometimes purple spots; this is due to its preparation. At Cape Ann, Massachusetts, in the summer, one can see large heaps of Irish moss bleaching and drying in the sun; they have to be kept turned over and protected against rain and moisture. When fully and sometimes too fully dried they are sent to market, where they will keep for some time; the odor in drying is of the salt sea, albuminous, sometimes approaching putridity.

Chemistry: Contains starch, pectin, compounds of sulphur, chlorine, bromine and iodine; oxalate of lime, fatty matter, free acids. The active principle is called the Carrageein, as the vernacular name of Irish moss (Carrageen, from a town in Ireland). Carrageein differs from gum as alcohol throws down no precipitate from its watery solution; from starch, as iodine does not turn it blue; from pectin by no precipitate with sugar of lead and by no mucic acid with nitric acid. The pectin group (our knowledge is imperfect) may all be more or less present in the plant as follows: Pectose (unknown), pectin, pectonic acid, pectic acid, metapectic acid; the proportions of carbon, hydrogen and oxygen are the same in these bodies and correspond with the formula C8, H10, O7; these bodies compose fruit jellies; pectoric acid is soluble in boiling water, hence most fruit jellies liquefy on boiling; pectic acid is insoluble even in boiling water; metapectic acid is formed by too long boiling, by too long contact with acid or alkalies, and by decay from pectic and pectoric acids.

Freny says it is very soluble and quite sour to taste. Ripe quinces, strawberries, peaches, grapes, apples, etc., furnish this pectose group.

Physiology: The structure and tissues are so soluble, that it is a physiological food. The carbon, hydrogen and oxygen are combined with a good amount of soluble mineral food, which is needed for the healthy functions of the body and should, we think, always be associated with the carbohydrates. The latter are poor food taken alone. This was shown in the harmlessness to teeth of sugar-cane juice as compared with pure mineralless white sugar, bleached with blood charcoal.

Disease: We wish we could get hold of a history of Ireland when the effects of sole feeding on Irish moss were reported, but so far as we know Irish moss produces no disease effects as now used. Nor do they destroy tissues.

Sole food: We do not know, except as herein noted.

Multiple food: Used generally with water, milk and sugar.

Cures: Its blanc mange has cured cases of chronic diarrhœa.

Head and heart: Not particularly good or bad. Its easy digestion by a sick tubercular alimentary canal proves this; is also a good food for the diet list of literary men.

Eyes: The mineral elements found in Irish moss make it a good ocular food. The carbohydrates are properly balanced with inorganic matter.

Bone, teeth, nails, hair: Fair; not positively excellent.

How often used: May be right along.

Action on intestines: As it is so digestible and gasless its action is good.

Heat: Abundant supply. *Force:* It furnishes some. *Climate:* Used in temperate climes.

Natural: Save it is combined with milk, but there is no abstraction of natural elements except in the drying. It is eaten by children raw, without harm.

Aesthetics: Is an æsthetic food; the blanc mange can be moulded into so many æsthetic shapes and attractive forms to grace the table display and confer elegance and beauty of the caterer's kind; it would be well if it were more fashionable because of its excellent qualities.

Religion: None bars it from the diet.

Builder of tissue: Yes, in a measure.

Effect on skin: Good as far as known.

Fermentation: Wet and undried, it does not keep well and deteriorates from the fermentation of its carbohydrates.

Parasites: There are some possibly but we do not know them save those of the fungi description. Algæ are very much preyed on by vegetable and protoplasmic (animal) parasites, some of which are innocent guests of the host; these parasites are so numerous and constant that some species of algæ were defined by them, but we know of no poisonous parasites on Irish moss properly prepared.

Intemperance: Never knew of it, but it is possible. It does not set up a gourmandizing appetite.

SPINACH

Spinacia oleracea is largely used as food, but does not date back of 1589 (Cogan); no mention of it by Galen.

Good: As a relish and anti-scorbutic. It fills a place of greens on the table specially in spring time and summer.

Bad: When too freely eaten it has the credit of purging the bowels by a diarrhœa that nature sets up to rid the alimentary tract of injurious fermenting foods undigested.

Condition of feeders: Save the suckling, all can use spinach if in health. Not good for the sick, but borne by convalescents in latter part of period of recovery.

Morphology: The rootless plant is used; its structural tissue is fragile, tender with the chlorophyll and protoplasm, hence its easy digestibility. Spinach cooked at hotel, March 14, 1902; the usual elements of a leaf; two membranes with stomata enclosing parenchyma of cells of chlorophyll changed to dark brown; cell walls thin, containing transparent coagulated protoplasm, large relatively, generally two-thirds of contents mostly kidney shaped—besides some obovoid substance cells about four times the size of above cells with clear transparent walls and filled more or less with raphide crystals, some like large starch cells, some with angular crystals projecting and some oblong parallelopipedons like triple phosphate crystals; these were very beautiful objects under the polarizers; in one case they filled half these cell walls; the usual spiral tissue pitted ducts found; the tissues were tender and made an easy object to study.

Chemistry: United States Government analysis: water 92.3, protein 2.1, fat 0.3, carbohydrates 3.2, ash 2.1, calories 110. *See also* page 124.

Physiology: Acts as a relish and does more by supplying the lack when the natural appetite calls for fresh pot herbs—when stored and dried vegetables have been eaten in the winter; it makes the liver to secrete bile better.

Disease: Unless too long and too much eaten, spinach is not disease producing as to organic structural lesions, but is rather a function perverter making the normal peristalsis run into diarrhœa. And as we have shown, even this is or may be curative.

Sole food: We know not. Spinach grows abundantly in the South. In times of great scarcity of food, the negroes have been known to eat green peas but not spinach, whose food powers were well known.

Multiple food: Always in connection with other foods as in old times in broths and soups and now as a part of the multiple food repast.

Cures: The tendency to scurvy after the winter months is cured by spinach.

Head food: Hardly, save as an agreeable stimulant, increasing the apprehension or desire for more nourishing food and its digestion.

Heart food: Only as it increases the assimilation of more force food and stops the losses incurred by a sluggish and torpid state of the digestive organs.

Eyes, bone, teeth, nail and hair: Indirectly; spinach being eaten solely, diseases of said organs would manifest themselves in decided ways. Relishes are deficient in mineral elements.

How often used: Generally once a day at the dinners in spring, summer and fall.

Intestines: Not abused, spinach acts very kindly on the intestines, because so easily digested and because of its anti-scurvy qualities. Abused, spinach causes chronic diarrhœa, but not near so decidedly as baked beans or oatmeal, because of the tenderness of its woven elements of connective tissue.

Heat: Yes, as its carbohydrates are apparently abundant. *Force:* Not much.

Climate: Temperate climes and not grown naturally in cold weather; artificially raised for the city markets the year round and helpfully.

Customs: No interference save by boiling to make more digestible.

Aesthetic: It is a fashionable food.

Religious relations: None specially. *Tissue builder:* Not directly much. *Skin:* Good.

Fermentation: Not much, properly used. The diarrhœa from its abuse is due to the fermentation in the overloaded and surcharged condition of the bowels. But the mildness of spinach towards the digestive organs requires much abuse to make fermentation.

Parasites: Beyond the ordinary fungi and worms that come to the foliage when the plant has not proper mineral food, we do not know of parasites infecting spinach. There is more wilted and fungus infected spinach found in January than in any other month.

Intemperance: We know not of such.

ONIONS

Allium cepa belongs to the lily family, which has two thousand three hundred species and comes from Central Asia, as lately discovered. Have been used all over the world as food. The earliest mention is B.C 1490.

Good: When properly prepared. They are considerably eaten raw but much more cooked and add a relish to other foods.

Bad: For the sick and diseased, save in scurvy; also when abused.

Condition of eaters: Should be healthy, save in scurvy cases.

Morphology: The onion is the bulb of the plant; the shoots are not eaten unless young and tender; the bulb is made up of concentric layers, nicely fitted together and yet so as to be easily peeled off. The texture of the common onion is dense, tough and almost transparent, so that it needs boiling, steaming or stewing for edibility; if young and tender, the bulbs are sometimes eaten raw. Raphides are found in the substance, supposed to be oxalate of lime. The walls of the onion layers are smooth and linearly run in a vertical direction; between them is a protoplasmic flesh substance with oil and raphides; the outer coats of the onion are dry and membranous, reddish, white or yellowish, according to variety.

Chemistry: They contain a white acrid volatile oil holding sulphur in solution, albumen, much uncrystallizable sugar and mucilage, phosphoric acid, free and combined with lime, acetic acid, acetate of lime and liguin. *See also* page 124.

Physiology: Onions have a sweetish acrid taste. They stimulate, act on the kidneys and lungs, and locally applied redden the skin.

Disease: In large quantities they cause flatus, gastric irritation and febrile excitement from fermentation; diarrhœa may ensue; also "when raw bad dreams and headache mar the memory and trouble the understanding." (Cogan, 1589.)

Sole food: We know not.

Multiple food: Always; when boiled, the volatile oil is driven off and onions then take place with other esculents, specially at a Thanksgiving turkey dinner, when their flavor makes harmonies with the other palatal and nasal music of the festival.

Cures: Onions have a popular reputation for being good for the liver; they are most excellent in scurvy. Their sulphur should make them good for baldness, as hair has so much sulphur as to make its compound with ammonia amide well known when burnt. Onions have always been considered good for coughs, especially the squill preparation prescribed by physicians. But the idea is now to stop cough by stopping prime cause, *i.e.,* bad food, which ferments in the alimentary canal. Asthmatic coughs due mainly to gravels of the air passages are best relieved by aerated distilled water, at the same time giving a diet that does not yield gravels in excess. Onions lessen the viscid tight phlegm or mucus, undoubtedly.

Head and heart: No, save as relish.

Eyes, bone, teeth, hair, nails: Save as to its sulphur, phosphorus and lime, onions are not specially good foods for these.

How often used: Not often, as they clog the appetite.

Intestines: Eaten cooked, and in moderation, have no bad effect because they digest well and sometimes help the liver. If the intestines are dilated, enlarged or thickened by onions, such is due to over-feeding.

Heat: Furnish heat because of the carbohydrates and mucin.

Force: Not much, as compared with that of dates, whole wheat, rye, barley. Carbohydrates may furnish force on emergencies, but they burn out in the body like shavings in a stove, only slower.

Climate: Has great influence over the quality of onions. Bermudas are larger, milder and more tender than the onion of the United States. The Egyptian onion for which the Jews inordinately longed, were highly esteemed, as Egypt was admirably adapted to their culture. Frederick Hasselquist (Swedish naturalist, 1722-1752) said: "He, whoever has tasted onions in Egypt, must allow that none can be better in any part of the universe. Here they are sweet; in other countries they are nauseous and strong. Here they are soft; whereas in northern and other parts they are hard and their coats so compact that they are difficult of digestion. Hence they cannot in any place be eaten with less prejudice and more satisfaction than in Egypt."

Natural: Customs have not changed the natural proportions of onions before cooking.

Fashionable: Not fully. Those who are to engage in any social function or occasion refrain from eating onions at or before said events, because the odor from same pervades the breath for quite a day after eating—which is neither pleasing not grateful to the æsthetic tastes which demand that all must be beautiful to the eye, ear, nose and palate as far as is possible. And how can this be when a nauseous, stale, rank odor that smells so horribly that one feels as if the teeth were set on edge or a pail of cold water poured down one's back. This effect, of an onion tainted breath in society occasions, shows one influence it exerts on the spirits of men.

Religion: Relations have existed. Juvenal and Lucian the Greek poet, in the first century, A.D., ridicule the superstitious Egyptians, who did not dare to eat onions, leeks or garlic, for fear of injuring their gods. Satire xv. has this passage:

"How Egypt, mad with superstition grown,
Makes gods of monsters, but too well is known.
'Tis mortal sin an onion to devour;
Each clove of garlic has a sacred power.
Religious nation, sure! and blest abodes,
Where ev'ry garden is o'errun with gods!"

It is probable that all Egyptians of Moses' time are not included here. Herodotus, the most ancient of Greek historians, does not indicate the superstition. Per contra, Diodorus Siculus says that onions were permitted to the people. Others say that the priests were not permitted them, and this might have caused the satirist to infer that onions were reverenced as divinities. Be this as it may, the desire of eating onions violated the national worship of the Israelites and was followed by a terribly fatal plague.

Builders of tissues: Yes, moderately. *The skin:* Good.

Fermentation: The juice of the onion can be made into an alcoholic liquor, as it has sugar. We know of no instance where it has been, but it would have its flavor insured by its abundant oil.

Parasites: The onion fly, Anthomya ceparum, whose larvæ (onion maggots) feed on onions, sometimes eating the upper half of the bulb. Onions also are subject to blight and mildew fungi if not properly manured or kept too wet.

Intemperance: Possible, from the delicious flavor and appetizing qualities and because they give a pleasant touch to the mouth and pharynx during swallowing.

LEEKS

Allium possum: Used since over 2000 B.C. They are a species of Allium, having a very small bulb and long narrow shoots, which are used to flavor soups because of the abundant essential oil. Much used in England in the sixteenth century for medicine. They are relishes and valuable; mentioned here because allied to onions.

GARLIC

Allium sativum: An onion said to come from Sicily; used in the third millennium B.C. in Egypt. Bulb is composed of ten or twelve divisions called cloves. Its taste is very pungent and sharp. Now much used by the Latin races as a condiment.

Good: Yes. *Bad:* Yes, when eaten raw.

Morphology: Its bulb is divided into ten to twelve sections called cloves, which are whitish, moist and fleshy. In the sample* before us, the bulb is whitish, in three vertical divisions (cloves), each of varying size, covered with white

*Furnished by Frank A. Lorenzo, M.D., of Punxsutawney, Penna.

membrane and inside facets with pale yellow membrane; this want of uniformity with onions, whose substance is made up of concentric laminæ, does not make garlic *not* in unity with onions, but shows how the Creator has several modes of doing things, so that one must be careful about drawing general conclusions from single types; there would be less conflict of organized religions, were this understood; the structure of specimen is very delicate and fine; curiously, in the center of a cross section, there is a greenish round spot, which is a ring much like the outside layers of fruits in intimate structure, another reversal of structure, putting outside in, as the lobster has his skeleton outside and man his inside, and both animals. There are some oil globules excreted by the cells of the garlic that gives the well-known odor. Its substance is made up of colorless transparent cells of cellulose of the utmost delicacy and beauty, filled with protoplasm; does not polarize light well; we think its architectural structure entitles it to the high estimation it is held among Italians. It seems akin to asafetida. The central greenish mass, round or oval, has a distinct peripheral ring of darker structure, which proves to be made of prisms of cells, laid side by side much like the prisms of the skin of the Boston baked beans; the inside is made up of cells, oblong, parallelopipedons, with abundant bodies appearing like the stomata of leaves; but some of them had in the center of inside cell a darkish nucleus and not an opening as first thought; probably these are the cells that secrete the garlic odor; a longitudinal section of a "clove" shows this central axis to be the embryo of the shoot, whence the garlic sprouts; there is not much spiral duct tissue in the specimen examined.

Chemistry: It has a very volatile essential oil as first distilled, heavier than water and of dark brownish color, decomposed by boiling; repeated distillation in salt water bath purifies it to a pale yellow color; it is not decomposed by boiling. This oil is called *Allyle* C6 H5 S. The impure oil has an extremely pungent odor, strong acrid taste, irritates the skin and sometimes blisters. In 1406 parts, there are mucilage 520, albumen 37, fibrous matter 48, water 801. Sulphur, saccharine matter and starch are found. The flesh bulbs yield by pressure quite one-fourth part of a highly viscid juice so thick as to need dilution with water before filtering. The dried juice serves as a lute for porcelain. Water, alcohol and vinegar extract the virtues of the cloves. Continued boiling spoils.

Physiology as a condiment: Its oil is speedily absorbed, and going through the system is smelt in the breath and secretions. Applied outside, as to the soles of the feet, it imparts its odor to the breath and secretions, and according to some may be tasted in the mouth. It is a general stimulant; excites the nervous system; the cloves may be swallowed whole; moderately taken it assists feeble digestion.

Disease: Used largely, causes gastric irritation, stomach distress, flatulence, hemorrhoids and fever.

Sole food: Not for more than a few days.

Multiple food: Always.

Produce disease: Yes, if abused.

Cures: In some case of feeble digestion.

Head: When taken largely, makes head to ache.

Eyes: Eaten raw, the essential oil stings the eyes.

Intestines: Distended by too much use. *See* Disease.

Climate: Best in cool climates, though much used by Latins.

Aesthetics: Garlic is not fashionable, and those who do use it are given a wide berth.

Religion: See Climate. The Talmudists often mention the fondness of the Jews for garlic. Dioscorides asserts that garlic grew plenteously in Egypt, esteemed, eaten and worshipped:

"Their gods were recommended by their taste.
Such savory deities needs be good
Which served at once for worship and for food."

Builder of tissues: Not directly.

Effect on skin: The essential oil greatly irritates and even blisters.

Fermentation: Somewhat, if not used rightly, but generally the sulphur prevents fermentation, which all condiments also do, a recommendation for them as a class.

HORSERADISH

Nasturtium or Cochearia armoracia of the mustard family (Cruciferæ), known to Pliny 23-79 A.D.; introduced from western Europe; cultivated in most civilized countries; strictly it is a condiment and not a food, but condiments are used in, with and as foods. To repeat, with condiments foods that pall are made to be relished and more nourishment is taken. This is important, especially when the eater is under stress of labor, worry or pleasure that exhausts the vital forces. How many women there are who cannot eat because of domestic stress (as severe illness in the family) and will keep up and about for a long time foodless, sleepless and without rest; generally they will go on thus, until all at once they break down suddenly in swoons or nervous prostration, simply for the want of hearty food; if condiments will enable such women to eat they act as foods.

Good: For well people, especially under strain, as a rule. *Bad:* For the sick, with exceptions.

Morphology: The connective fiber of the root, which is the part used, is not so tough, but that when ground or grated it can be used raw in small amounts. The microscope shows dark yellow colored oil globules, and an abundance of starch grains that are very small compared with wheat starch grains, being on an average the size of red blood corpuscles in man, 1-3164th of an inch; some are found of the size of the white blood corpuscle (man), so that the field in the microscope impresses one as if filled with human blood; some of the smaller starch grains had automobile motion, like fat globules in milk; the iodine test showing them colored, proved they were starch and not fat. The substance cells: some spindle shaped, stout, short, and some looked as if made by cross walls, as the division of a cane fishpole. The walls of cellulose are delicate, spiral tissue ducts are large, so that the horseradish root is not toughly put together, and hence suitable for raw food. The oil is dissipated by drying and the root becomes thus inert in time.

Chemistry: The fresh root contains oil and bitter resin minute in quantity, sugar, extractive gum, starch, albumen, acetic acid, acetate and sulphate of lime, water and lignin. Winkler's observations infer that myronic acid combined with oxide of potassium and that myrosyne exists in the root; that the reaction of this acid when horseradish is bruised in water produces the volatile oil. Horseradish distilled in alcohol yields none of the oil, so that bruising is a good thing to make horseradish more pungent. *See also* page 124.

Physiology: Highly stimulant, exciting the stomach and promoting the secretions. It stimulates appetite and invigorates digestion; it is not the starch, but the oil that is active. Oliver Wendell Holmes, in 1853, while describing the nerves of smell, called attention to the fact that a too large taste of good horseradish would instantly, before swallowing, go through the hard palate and painfully affect, not only the nerves of the nostrils, but also the olfactory bulbs above the cribriform plates; but the mystery as Dr. Holmes indicated is how, the mouth being shut, the volatile oil could go through the hard palate. Externally oil of horseradish is a rubefacient.

Pathology: No doubt, if it could be borne long enough, horseradish in the mouth would produce disturbances of tissues. The amount of its starch is so small, when used as a condiment, as not to be injurious.

Sole food: We do not know, but probably not a day. Its sole use is so alien, that none but a lunatic would try to live on it solely, unless for biological experiment.

Manifold food: Always.

Cures: Loss of appetite, weak digestion and torpid secretions if water enough is drank. Has been recommended for palsy and rheumatism. In scurvy is fine. Hoarseness it relieves. It is a pure stimulant. Parr states that an infusion acts as an emetic and that the root promotes salivary secretion.

Head: Its action as lectured on by Dr. Holmes, shows what a powerful agent it is for the head, not as a food but as a disease producer; not a doubt, though, that it helps the head by helping digestion and nutrition. In this sense it is good for students and literary men.

Heart: As it promotes digestion and lessens the gas in the bowels it is good.

Eyes, bone, teeth, nails: Not specially good or bad.

Hair: So far as sulphur is an assimilable element of horseradish, it must be good.

Intestines: It promotes their secretions, tones up their glands, and its sulphur hinders ferment growths.

How often used: Conventionally during the spring and fall and often through the winter. It is specially grateful to man, when the frozen soil is thawed in the spring, as most every one knows.

Heat: We do not know, but the small amount of starch cannot furnish many heat units.

Climate: Temperate climes. Cayenne pepper is better than horseradish in warm climates.

Natural: Fortunately yes. *Aesthetic and fashionable:* Certainly.

Religion: No relation that we know of.

Fermentation: Its sulphur acts against fermentation.

Parasites: We do not know of any.

Intemperance: One after an experience with horseradish such as Dr. Holmes describes would not intemperately use it again.

RADISH

Repharus sativus: Condiment: Mentioned by Pliny and now very commonly used in the civilized world.

Good: For well people. *Bad:* For the ill.

Morphology: Is a narrow, tapering to nothing, root about four inches long and half inch wide at base; is covered with a beautiful red skin in some varieties; the white variety not often seen in the United States. Its tissues are crisp and yet tender, when fresh and kept in water. Wilts if dry. There is a globose variety.

Chemistry: Has a mild tasting oil. *See also* table, page 124.

Physiology: Anti-scorbutic and grateful relish to any early summer meal, especially when it first appears.

Sole food: Never.

Manifold food: Eaten raw during the meal; it is usually brought on the table in glass tumblers of water; often the way is to dip the moist small end into powdered salt and then eat; for years it used to be cut in thin transverse sections and sprinkled in layers with salt and beaten somewhat soft before eating. Were much eaten with mutton and Cogan says the best are white, that they are neither good before nor after meat, but as a sauce.

Disease: When eaten raw after meats it ferments; in those of weak stomachs and feeble digestion it produces fetid gas and thus corrupts the breath.

Cures: They are rightly used only in health.

Head: If well digested, do not hurt.

Heart: The sulphur that must be in the oil of radish, enough to produce fetid eructations, must be deleterious to the heart when too largely used.

Intestines: If eaten by the ill or wrongfully by the well, the result is detrimental to the stomach and intestines, especially if nature does not eruct the gas. Drafts of hot water or even cool water excite upward and downward peristalsis and relieve, but if radish is eaten moderately as a sauce there will be little harm to the bowels.

How often used: Moderately in their season. Hothouse radishes out of season are not so good as seasonable ones and cannot be so long used.

Heat: Not appreciable, except to taste.

Force: Not much.

Climate: Temperate.

Natural: Is one of the most natural in condition of all edibles.

Aesthetic: We think there is more real eye and perhaps palatal music to fresh, crisp and sound radish as set on the white linen table-cloth in cut-glass tumblers, than of almost any other vegetable. Its unexpected sight when it first comes on the table of fashion or no fashion will set the mouth to watering from the buccal glands.

Ferment: One would think that the sulphur in the radish would keep off the yeast action; but too much of a meal being eaten, indigestion follows despite sulphur, *Parasites:* There are worms that infest radishes and they leave the marks of their ravages so plain as to be unmistakable.

Intemperance: There is danger of over or wrong eating of radish when the eye and the palate are much charmed with them, but there will be no trouble if the head governs the appetite.

MUSTARD

Family of the *Cruciferae:* Brassica or Sinapis alba, white mustard; Sinapis nigra, black mustard. (Sinapis because it hurts the eyes.) *Condiment:* Pliny and Vegetius mention it. A table is not considered fully set without mustard; food writers say little or nothing of it. Mentioned in the Bible A.D. 32.

Good: When moderately used. *Bad:* When immoderately used, it is emetic and the best domestic remedy for almost every common poison.

Condition of feeders: For well people with little appetite, especially in the emergencies of hard labor or exercise; is used as in convalescence, in some diseases, and as a revulsant universally.

Morphology: The seed is the part used as a relish. Two kinds—white and black (see Chemistry); these are as follows: black seeds are small, globular, deep brown in color, slightly rugose on the surface, internally yellow; white seeds are larger than the black and of yellowish color; both have a fixed oil yielded by pressure, little smell and mild taste, not unpleasant; the oil saponifies with oxide of potassium and also yields a peculiar acid, "crusic." The white mustard seeds are most used in powder and the market. *Pure mustard (commercial) under the microscope:* The substance is made up of masses of finely reticulated connective fibrous tissues in small hexagons, filled with granulized oil and massed together into large globar masses, seven hexagons being counted in one diameter; the globes do not touch, but are separated by darker hexagons; these hexagons seen in the specimens were generally quite dark in color, and in some instances, light (in the Micrographic Dictionary, the hexagons are figured with nucleus and nucleolus in each; this is correct); the field is full of oil globules of large size, while they are in smaller subdivisions down to about 1-10,000th of an inch; at first, they seem like minute starch grains, but they had automobile movement, did not polarize light nor turn purple with iodine; the last made them yellow and the manipulations brought out forms like the oils of butter; the connective fibrous tissues observed in this specimen were hexagon-oblong cells six times as long as broad, some white masses filled with fine dots, one cell oblong like a half carrot filled with dark matter much like the protoplasm of aleurone cells in wheat and which might be called myronic cells were it not that myrosyne is said not to be found in Sinapis alba. (*See* Micrographic Dictionary, plate 2, figure 11, for morphology of mustard seed, which corresponds with the above description, save the rings of connective tissue which we did not happen to meet.) Slender tubes like hairs grow at right angles to the long diameter of the mustard root, appearing like velvet when the soil was washed off. Thus the actual root surface exposed to the soil becomes incalculable.

Chemistry: Is peculiar and not fully understood. First, The fixed oil; Second, Volatile oil obtained from the seeds whence No. 1 has been expressed, which does not exist in the seed and is formed by the action of water; Third, In black mustard seeds, "a," the myronate of potassium; "b," and myrosyne an albuminoid like emulin in almonds. Adding water to black mustard seed, the myrosyne acts as a ferment, producing a reaction between the water, oxide of potassium and oxide of myrosyne, which results in No. 2, the volatile oil; water and myrosyne or any of the myronates do the same. If black mustard seed is treated with heat, acids or alcohol, the myrosyne is inert and water produces no volatile oil. Water long in contact sometimes restores the myrosyne power in part. Fourth, In white mustard seed there is myrosyne but no myronate of potash, so if white mustard seed and water are added to the black in which myrosyne has been coagulated, the volatile oil will be produced. The volatile oil is colorless or pale yellow, heavier than water and has an exceedingly pungent odor and an acid burning taste. Boils at 298 Fahrenheit, slightly soluble in water and readily so in alcohol and ether; with alkaline solution yields sulpho-cyanurets, formula C8 H5 S2 N. It is considered sulpho-cyanuret of allyle; it is the principle on which black mustard and seeds depend for activity. White mustard seeds do not develop volatile oil when treated with water, but an acrid principle is developed for the same use as the black seeds resulting from the action of water or sulpho-sinapisin, because mustard deprived of sulpho-sinapisin did not develop said activity. If the myrosyne or emulsion is inert from heat, acids or alcohol, this reaction fails. Sulpho-sinapisin or sinapin C32 H26 O12 N has an appearance of crystallized sulphate of quinine. It appears that it is the sulphur that gives the pungent matter in mustard, but the chemists have not got to the bottom of the subject and probably never will. *See also* page 124.

Physiology: Seeds swallowed by the tablespoonful with molasses or softened by soaking in water are laxative; also mustard powder arouses the stomach and is an emetic in large tablespoonful doses. It acts on the nose and palate worse than the horseradish action. Applied to the skin mixed with water, it blisters with burning pain as to be insupportable to a man much within an hour, oftenest in four minutes, but women will bear the same a long time; kept on too long it will blister with obstinate ulceration and even rotting. This caution needed when the sick are insensible. On the other hand when fussy, very sensitive and apparently in acute agony, mustard gives a test when applied, as the patient will complain of the plaster, and we know the disease is not up to standard of tolerance. Again the really sick sometimes almost go to sleep saying the pain of the mustard was a relief because so much less than the original pain. (A paste of mustard and molasses can be used much longer than the ordinary plasters, producing deep redness of skin, without blistering; if the ordinary plaster is used, place two or three sheets of thin paper between it and skin.)

Destruction of tissues: The volatile oil speedily blisters; one-sixth of a drop in half an ounce of olive oil internally is a dose; in overdose, it is highly poisonous, producing inflammation of the stomach and bowels and imparts its odor to the blood and urine.

Sole food: Cannot be thus used because of the heavy shock to the palate, nostrils and olfactory organs.

Manifold food: Decidedly, and in minute portions.

Cures: By its stimulation and also by its sulphur control of fermentation.

Head: Good by aiding digestion and increasing the amount of force food eaten, but bad when taken too largely, by its causing sneezing and distress of the olfactory nerve bulbs.

Heart: Good as an emetic if the stomach is overloaded with indigestible food, and when by condimental doses preventing the evolution of a stomach gas.

Hair: Good, from its sulphur.

Intestines: Promotes the flow of juices and prevents in a measure the formation of gases by its sulphur.

How often used: This varies with individuals, some daily and others rarely.

Heat: Some directly and also indirectly as a stimulant.

Force: The amount of nitrogen in the volatile oil and sinapin must give some force to the eater, but it is the force of the whip to the horse rather than the force of the horse's hay and oats. If force is needed and only condiments are to be had, mustard would be a good sauce; indirectly it furnishes force by causing more food to be eaten.

Climate: All. *Natural:* Yes.

Aesthetics: Mustard has a place on the tables of fashion and is good form in the best of society. This is fortunate, as thus there is in almost every house a remedy for poisons and colic that often comes from the adherence to the æsthetic principles of dietetics.

Religion: No relation, save the mention made by Christ.

Builders of tissue: May confer nitrogen on the ganglionic nerve centers.

Skin: Its sulphur is good for the hair, but as mustard, all over the world, in all schools of medicine, from ancient times, has been used as a poultice for the skin, especially in ills that come directly from feeding badly, it is not amiss to refer to it here at the risk of repetition: first, the action of mustard poultice put on the skin is to give a great and powerful sensation of coolness, as if the poultice was a sheet of ice; this is due to the evaporation of the volatile oil of mustard which takes heat from the warmth of the skin close to it; the high boiling point, 298 Fahrenheit, is against this, but many a time have the eyes smarted from this oil when putting on mustard poultices, showing that the oil was volatile at ordinary living room temperature. After a few minutes, if the patient is a man, he will howl with the pain of burning and often say he is being killed and require its removal at once to prevent such a catastrophe; but a woman does not do this, and the poultice to do good must be on ten minutes. The skin is reddened as in scarlet fever, sore and tender because of its congestion and acute inflammation. The effect of this is almost invariably to relieve pain of a functional, not organic kind. The reason has not been explained. It may be said that abdominal pain from indigestion is regarded as a colic from partial paralysis, resulting from the gases of fermentation and from overwork, as in writer's cramp the muscles are partially paralyzed and painful. Hit a man with a birch switch and it will pain from partial paralysis; completely paralyze a man with a crowbar and you have no pain but unconsciousness and maybe death. Some explain by the doctrine of revulsion, that is making another and larger center of partial paralysis, which does not interfere with the nerve centers, as in colic, the seat of the disturbance is removed by the mustard to the skin and the colic disappears because there is not nerve resistance enough to cry out in pain while time for recuperation is gained meanwhile. Certainly there is pain enough under a mustard poultice to illustrate the definition of partial paralysis and the fact of the intimate vicariousness of the skin with the alimentary canal is shown in the evil results of terrible burns, even being so bad as to cause pneumonia, gastric ulcer, peritonitis and death. Some people say mustard's place is on the abdomen while turpentine spirits are best on the chest; we think so.

Fermentation: Mustard is apt to ferment if mixed too long, but it keeps well much longer than most any other vegetable kingdom food mixed with water and exposed to the air, because of its sulphur.

Parasites: Moulds if kept too long.

Intemperance: This is prevented by its physiological action; the pain and vomiting are warning enough to be heeded by all eaters.

LETTUCE

Lactuca sativa: The word is derived from the old French Lettuce, Latin—lac—milk, referring to the juice. Came from Europe; genus Lactucæ. Many varieties, but can be reduced to two—Cos, or leaf lettuce; Cabbage, or head lettuce. Part used in kitchen are the leaves. Mentioned by Pliny, Galen, Poet Martial, Cogan, 1589. It is used generally raw by the civilized world; not often boiled except in broths. Martial says that lettuce should be eaten last. Cogan says "wee eate lettuce in the beginning of our meales." Salad is derived from the Latin Sal—salt. Strictly speaking, it is a food, for its elements enter biologically into our tissues and we shall see lettuce to be a very complex organism.

Good: For well people. *Bad:* If improperly used.

Condition of feeders: They must be in healthy condition or at least at the termination of convalescence.

Morphology: Has the ordinary structure of so-called green vegetables, two skins with curious re-entrant curved epithelial cells with stomata; between the skins granular matters, chlorophyll, spiral tissues and glands loosely put together and thus digestible; all the tissues are extremely delicate, transparent and softish to the feel; a good subject to study under the microscope; does not polarize light well.

Chemistry: United States Government report average (as purchased): refuse 18, water 77.1, protein compounds 1.1, fat 3, carbohydrates 2.7, ash 8.1, heat units 85. The dried milky juice is called Lactucarium, sometimes known as lettuce opium. Buchner, 1832, found a principle he called Lactucin. Walz, 1839, gave analysis as Lactucin, volatile oil, a fat dissolved by ether, fat not readily dissolved by ether, reddish-yellow resin, greenish yellow resin, sugar, molasses gum, pectic acid, humus, a brown basic substance, albumin, oxalic, citric, malic and nitric acids, potash, lime and magnesia. Aubergier, 1842, gave this result: Lactucin; mannite; asparamide, a substance that colored green the sesqui salts of iron; resin combined with oxide of potassium; a neuter resin-ulmate of potassium; cerin; myricin; pectin; albumen; oxalate of potash; malate of potash; nitrate of potash; sulphate of potash; chloride of potassium; phosphate of lime and magnesia; oxide of iron and magnesia; silica. Ludwig found 48.68 per cent. insoluble in water and 51.37 soluble; 42.64 per cent. of the insoluble was lactucerin or lactucone, C40 H34 O6; 39.9 wax; lignin, a substance insoluble in alcohol, water, ether. The 51.37 soluble part was made up of albumin 6.98, lactucerin 1.75, bitter extract 27.68, watery extract insoluble in alcohol 14.96. Besides, Ludwig found a mannite like substance, oxalic acid, an organic acid undetermined, a soft resin, oxide of potassium, magnesia and iron. *See also* page 124. These chemical analyses show that lettuce is not the simple substance it looks to be. It shows the wonderful industry of French chemists and that lettuce must be regarded as remarkable for its organic and inorganic elements and more desirable as a relish because whatever may be said of the above analyses, lettuce has a wonderful variety of material to help sustain life. Besides, it shows a breadth of technical culture in the past generations, the present cannot afford to ignore but ought to emulate.

Physiology: Galen commends lettuce eaten raw in clean water; says that when young he found it to relieve his stomach that was "infested with bile," and when old, he found it eaten at evening to be unique for insomnia. No doubt the many organic and inorganic elements found in lettuce contribute to the health. As before said, the histological and chemical elements are favorable to physiological use of lettuce.

Disease: The olive oil (often not fresh) and vinegar that are used in lettuce salad often cause the harm that is laid to lettuce. Lemon juice should always be preferred in place of vinegar.

Destroy tissues: No.

Sole food: No tests have been made.

Manifold food: Always thus used. We doubt if the hungry tramp steals lettuce as sole food.

Disease: Only by abuse.

Cure: Insomnia, bilious stomach, loss of appetite, scurvy.

Head: It is good from the wealth of composition, organic chemistry reveals. Lactucarium will harmlessly put to sleep when opium fails.

Heart: Lettuce indirectly is good as a hearty food and somewhat directly, as its chemical elements certainly must stimulate the heart.

Eyes, teeth, bone, nails and hair: Good for these organs. Lettuce is thus distinguished from all the relishes.

How often used: Frequently.

Action on intestines: Properly used, it has a beneficial action on them, is not gas producing, is good for the sympathetic or automatic nerve system that governs independent of the will.

Heat: See Chemistry.

Force: See Heart. *Climate:* Hot and temperate. *Natural:* Custom prefers lettuce as fresh as possible and with undiminished proportions.

Aesthetic: Its crispness, green chlorophyll, grateful mild taste and possibly its unsuspected virtues by way of mineral elements found in its juice, have made it a welcome addition to the dining table of fashion whose demands are met by hothouse supplies in the winter season.

Religion: No particular relation.

Builder of tissue: Its mineral elements supplied in assimilable and appreciable quantity are good builders.

Fermentation: All vegetables ferment. This depends, however, on their condition. If fresh, crisp and healthy looking and used properly and the condition of the eater is good, lettuce will not ferment under ordinary circumstances, but if for example the eater should immediately be called to put out a fire, digestion might be stopped entirely and which would result in the fermentation of the lettuce.

Parasites: If lettuce is not sown in good soil, and properly manured, its development is poor and its resistance to fungi and insects is weak.

Intemperance: Of course there can be, but it is not often seen unless in salads, and then the trouble is generally with the vinegar and sweet oil.

DANDELION

Leontodon taraxacum or *Taraxacum officinale*—one of the Compositæ or Aster family. Mentioned in Parr's Dictionary, 1808, but not in Cogan, whose works are very full on plants used as food. It must be used as food in Italy, judging from the acts of Italian women who dig for them in your lawn unless you drive them off; also used in New England generally in the spring of the year, though always in Boston market during the winter, being raised under glass in large quantities. (Dandelion is the English of the French dens-de-lion, because the projections on the leaf are like the teeth of lions. Leontodon is the Latin word.) Leaves the part used.

Good: Yes. *Bad:* No, for it is a mild medicine.

Condition of feeders: Not for the sick.

Morphology: Its leaves have two faces, with substance of spiral tissues (as tubes of circulation for the sap from the roots), chlorophyll and cells; it is used when tender and loosely adherent in fabric. It has a juice like milk made of minute fat like globules, bitter to the taste; juice abundant in the foot stalks of the aster like flowers.

Chemistry: Not analyzed by the United States Government. Johnson found in the milky juice, Caoutchouc (India rubber), bitter extractive, saline matters, a trace of resin and a free acid. Starch and sugar have been found in the root. Pollex has found in the juice of the root, taraxacin, a crystallizable principle.

Physiology: The root is a mild tonic, diuretic, aperient, excites languid livers and resolves the engorgements. The loose texture of the leaf is easily digested.

Disease: None, if not abused.

Sole food: We do not know; not long, as it does not have nourishment enough, save for a ruminant animal.

Manifold food: Always.

Head: Not much good, save as increasing the appetite.

Eyes, bone, hair, nail and teeth: Not much food for them directly.

Intestines: It digests easily, stimulates the liver and promotes the action of the bowel glands.

How often used: From April to December, save exceptionally when raised under glass in winter. The frequency of its use does not compare with that of celery.

Heat: Unknown.

Force: Not much force directly, unless in the case of the Italian laborers who have been accustomed to long feeding on it.

Climate: Hot and temperate. *Natural:* Ethics has not interfered with dandelions, which are eaten raw or cooked.

Fashionable: With all classes, but most with the Italians. They are not deemed indispensable as an æsthetic of the palate if other greens can be had.

Religion: No special relation.

Builder of tissue: Not much as far as we know.

Effect on the skin: Good, as it is an anti-scorbutic and helps digestion.

Fermentation: Not much in well people eaten moderately.

Parasites: If the plants are healthy and well fed they are not much preyed on by animal or vegetable parasites, but if so the parasitism is readily manifest to common sense.

Intemperance: Not noticeable of medicine. Dandelions do not allure nor establish an all-pervading appetite. They are meek, modest mild members of the relish family. They do not extol nor flaunt forth their real worth. It is probable that the said Italians would not so heartily and earnestly dig them if they had means enough to purchase other market greens when they get these simply by collecting them.

PARSLEY

Carum petroselinum (Greek) means rock parsley. Opium hortense (Linn). It has aromatic, finely divided leaves and greenish yellow flowers, much used for garnishing dishes and flavoring soups. Mentioned by Pliny. Parr says it is commonly eaten at our tables (1808).

Good: When properly used. *Bad:* Not very at its worst (Parr.)

Condition of feeders: Cogan and Fernelius say parsley is not good for children, nursing mothers and epileptics; so it is for the healthy.

Morphology: The cuticle of the stalk, and specially the leaves, are full of stomata, and the epithelia have curious gyrose margins. There is plenty of dense cellulose structure, pitted ducts, chlorophyll disposed in drops in masses and in chains on the cell walls—some oil (specimen was old), not much—little granular starch as shown by Lugol's solution. Parsley is a tough plant to eat and must have sparing use as a relish. The oil is its main charm in seasoning, though the crisp, green, notched leaves are a fine garnishing to a plate of fried soft clams for example. The oil is found in all parts of the plant.

Chemistry: Braconnot obtained a peculiar gelatinous substance in appearance like pectic acid, which he named apiin. The herb is simply boiled in water, the liquor strained and allowed to cool; the apiin then forms a jelly which needs only to be washed with cold water; the seeds contain an active principle named apiol. The plant has a pleasant smell and is an efficient instrument in the orchestra of palatal and nasal music, symphonizing or rather harmonizing well with the other olfactory instruments that cooks from time immemorial have employed in their cuisine.

Manifold food: Always and in very minute proportions.

Produce disease: Not as commonly used.

Cures: The root is said to be aperient and diuretic; has been used as an aid to active medicine in dropsy and kidney diseases. The juicy, fresh root has been used in intermittent fevers.

Head: Good, as an odor to food. *Heart:* May help in a mild way by stimulating the desire for substantial food.

Heat units: Do not know. *Force:* None directly.

Climate: Native of Sardinia and the south of Europe; everywhere cultivated in gardens.

Natural: Yes. *Aesthetic:* Decidedly so, as it comes in the perfumes of fashionable foods in soups. In this the fashion runs through the high and low strata of society.

Religion: None especially. *Builder of tissue:* No.

Fermentation: Oils are not very fermentable and often do not digest in the intestines and under ordinary use, parsley would not be expected to ferment any more than the oils of mustard or cinnamon.

Parasites: When the seasons are dry, parsley is eaten by a small black bug; it does not mould or mildew; in good health, parsley does not suffer from parasites.

Intemperance: Would be distastrous because of the toughness of the fiber and indigestibility. The dictates of common sense will preserve one from harm from parsley and the taste would reject it. We have known no instances of disease from intemperate eating of parsley.

CRESS

Cresso, because found everywhere. Mentioned by Cicero and Lucius Columnella, 45 A.D. Two kinds: (1) Garden cress, Lepidium sativum; or Nasturtium hortense (Linn); a low plant milder than water cress; used as a salad alone by the healthy and by cases of scurvy and debility of the intestines; its seeds agree in general qualities with mustard seeds. (2) Water cress, Sisymbrium nasturtium (Linn), is a juicy plant, grows in rivulets or standing fresh waters all winter; but is in the greatest perfection in spring; leaves are moderately pungent; the juice contains all the virtues of the plant; its use as a salad may be long continued, as it is inert as a medicine. No chemical analysis at hand.

OKRA

Hibiscus esculatus. Used to thicken soups. Fruit is the part employed and called Bender Gumbo. Cultivated in various portions of the globe. Also Abelmoschus esculatus. Okra is known in the market also as the unripe pods.

Gumbo soup is okra soup. Chemical analysis United States Gov't: water 87.4, protein 2, fat 4, ash 7, heat units 230, carbohydrates 9.5. We cannot speak otherwise of its value.

SQUASH

Cucurbita pepo: They belong to the Cucurbitæ, a small prostrate genus of the gourd family, the Cucurbitaceæ, embracing eighty-six genera and about 630 species mostly tropical, cucumber, watermelon, musk melon, pepos, cantelopes, etc., all of which show the great profusion of this kind of food. Another example that scientists are not so accurate in the names of squash as the vernacular. The summer pumpkin and winter squash have sixty different kinds, and yet the botanist calls them all Cucurbita pepo, save the winter which is called maxima. Squash is a contraction of American Indian word ashquash; so Cucurbitæ refers to the varieties found here among the Indians — and squash does not seem to go any further back. We will proceed to tell what we know about winter squashes, the maxima, including the crook neck.

Good: Properly selected and cooked.

Bad: No, if not abused.

Condition of feeders: Well people only.

Morphology: Is made up of the rind, about one to two inches thick, generally of hard dense structure. It has fifty per cent. of refuse skin and connective fibrous tissue, which has to be tough and dense to make such hard, rock like irregular hollow globar bodies. The hollow is filled with yellow strings of connective and vascular tissues holding the seeds and stretching out like giant spider webs attached to the concavity like the amœba like structure seen inside the plum cells. The main part of the substance eaten is made up of beautiful clear ovoid cells, containing clear protoplasm with irregular yellow nuclei, magnificent under polarized light; when cooked, they do not polarize.

Chemistry: United States Government report: refuse 50 per cent., water 43, protein 8, fat 3, carbohydrates 5.2, ash .4, heat units 125.

Physiology: Its dense structure makes it difficult to digest. It is agreeable to eye and palate.

Disease: Healthy men living on it solely could subsist for only seven days. In this time it produced colic, diarrhœa, flatus and symptoms of locomotor ataxia.

Manifold food: Always.

Cures: None.

Head: Fed solely, very bad.

Heart: Bad from its gases; must be used in moderation.

Eyes, bone, hair, nails, teeth: Bad when fed solely, on account of difficult digestion and because of small amount of ash.

Intestines: Is bad for them.

How often used: Not often and should be used sparingly.

Force: Uses up so much nerve force in its assimilation and also makes so much alimentary canal disturbance that it does not furnish much force to the body.

Climate: Hot and temperate climes.

Natural: Yes, save being eaten raw.

Fashionable: Not very.

Builders of tissue: Not much, because assimilated with so much difficulty.

Fermentation: Very liable to it, because of its carbohydrates and its tough texture.

Parasites: (1) squash beetle, Diabrotica vittata; (2) squash borer, Trochilium cucurbitas; (3) squash bug, Anasa tristis, a large brownish black North American coreid bug that sucks the stem sap.

Intemperance: Common sense protects against it.

SUMMER SQUASH

Cucurbita pepo: They are small, crooked necks, smooth and tuberculose, some flat, white and scollops, just like a cake loaf; are cooked before ripening into hard gourds; eaten in the summer, are mucilaginous and grateful to the taste. No analysis except that of canned squash: water 87.6, protein .9, fat .5, carbohydrates 10.5, ash .5, heat units 235. We know of no one who has been fed on summer squash exclusively, hence it must be esteemed like winter squash, differing from it in greater digestibility because more tender. It is a very inferior, unsatisfying, weak, sloppy food, only to be used as a relish and sparingly.

PUMPKIN

Cucurbita pepo: Scientifically the same as summer squash, but practically different in customs. This is a winter squash, and the largest of all, sometimes weighing over one hundred pounds.

Chemistry: Government analysis: refuse 50 per cent., water 46.6, protein .5, carbohydrates 2.6, ash .3, heat units 60. *Pumpkin canned:* water 91.6, protein 8, fat .2, carbohydrates 6.7, ash .7, heat units 150; these do not show a great amount of nourishment. They are used to make pies on Thanksgiving day in large quantities; do not furnish much force for the festivities of said day; this is more patent, when it is considered that mince pies have higher and more universal use than pumpkin, as mince pie has force to confer from beef.

Condition of feeders: Well people celebrating a fixed day, also the usage of the Pilgrim Fathers, who found pumpkins very abundant in America.

Morphology: It has a large amount of connective fibrous tissue with soft substance much like the tomato. Hotel pumpkin pie— considerable fat in globules of all sizes down to granules innumerable that came from the milk and butter used in cooking; specimen mainly made up of quite large cells of clear protoplasm with transparent walls and large nucleus coagulated by heat, as in cooked tomato; cell walls were very heavy, wrinkled, twisted and contracted; beautiful objects under polarizers; the nuclei were yellow; there was one large plate of tegument made up of very small prisms set side by side and yellow; iodine showed some starch, probably foreign; a collection of spiral tissue with oblong cells laid parallel around as in banana. Another specimen showed the outside tegument made up of good sized hexagonal, pentagonal and round cells thrice as large as those above named; large coils of spiral tissues beautifully shown, large stomata, spindle shaped long cells of cellulose; also large dark yellow mass of tegument, rumpled and rolled from cooking; some large masses of disrupted cells looking like cooked tomato cells. In some parts, the cooking was so thorough as to fuse all the pumpkin elements in to one homogeneous mass; under polarized light, the spiral tissues, cellulose, tegument and other details were simply glorious.

Physiology: Hard on the digestion and on tapeworms. In 1820, Dr. Mongery, a Cuban, published that he gave about three ounces of fresh raw pumpkin in the form of a paste followed by two ounces of honey, which honey was repeated twice at hour intervals; this resulted in the expulsion of the worm; the seeds have been generally used and the Cuban seeds are the best as a vermifuge

Sole food: Not longer than squash—seven days.

Multiple food: Generally in the form of pie.

Produce disease if solely fed: In all probability like squash.

Cucumis melo or *Citrullus vulgaris* are two species of the Gourd family. Extensively cultivated in the East Indies, China, Egypt, France and the United States; grow luxuriantly in Palestine, even in a dry and sandy soil. Mentioned by Pliny. Has a refreshing, watery juice.

Good: When properly used. *Bad:* If abused.

Condition of feeders: The hot and thirsty ones.

Morphology: Water melons are oblong, with finely rounded unpointed ends, green color spotted with white or whitish. The rind is thick (half inch) and dense and cuts with a crisp feel; next the rind is the reddish and purplish colored spongy parenchyma filled with seeds and gradually shading off from the rind; this inner substance is made of spiral tissue ducts, loose connective fibrous tissue, filled with beautiful oval cells of large size (for the microscope); these cells have coloring matter corresponding to chlorophyll, a nucleus in the midst of fibrillated protoplasm which when ripe is sometimes found undergoing the amœboid changes of protoplasm and forms one of the most beautiful exhibitions for study and observation; generally the amœba looks as if a spider were stretched in the inside of the hollow ovoid, the number of legs varying, yet so planted in the concave surface of the large cell, that the nucleus is suspended in the middle of the clear water of the cell. But like all amœbæ they vary very much; the motions sometimes are quite rapid.

Chemistry: United States Government report: refuse 58, water 39, protein .2, carbohydrates 2.7, ash .1, heat units 55. *Edible portion:* water 92.9, protein .3, carbohydrates 6.5, ash .1, heat units 130.

Physiology: The loose fiber, the large ovoid cells filled with water and nuclein, the fine flavor and the coolness are very desirable. In Egypt it is justly pronounced one of the most delicious refreshments, that nature amidst her constant attention to the wants of man affords in the season of violent heat. This well explains the regret expressed by the Jews for this old-time fruit, whose pleasant liquor had so oft quenched their thirst and relieved weariness in their servitude and which would have been exceedingly grateful in a dry and scorching desert (Harris); water melons afford a large supply of nuclein at a very small cost. Cogan speaks of melons (water) being cold and moist and doing the least hurt if eaten before meals. As a medicine they act on the kidneys.

Disease: Not harmful; some people eat them in large quantities with impunity.

Sole food: Do not know. Have known a man to make a meal of them and there must be many like instances when the usual depredations on fields of water melons are considered. Probably no cultivated fruit is stolen more largely. The analysis shows but little nutriment.

Multiple food: They are used largely on the table as a dessert, but they are eaten alone raw and mixed with other foods in the stomach.

Cures: Not much more than heat and thirst and the longing appetite for them.

Head: Not of much good.

Heart and eyes: Not much, save as feeding the desires of one and the longing of the other.

Bone, hair, nail and teeth: Not much.

Intestines: Good, as they are easily digested and assimilated and tone up the bowel glands.

Force: Not much directly except from nuclein and indirectly as a relish. There may be some active principles that our chemists have not detected in water melon. We need analysis as thorough as that of mustard made by French chemists.

Climate: Best in hot climates.

Natural: Yes.

Aesthetic: Decidedly.

Religious history: See Physiology.

Fermentation: Not much properly eaten. They are absorbed very soon.

Parasites: They are preyed on by fungi, but do not remember seeing them invaded by insects; the vines are, by both, but the latter are not edible.

Intemperance: Yes, very by some, but do not know of any case of poisoning or colic ever having been brought to our notice as physicians.

MUSK MELON

Cucumis melo is another species. The United States Government analysis is as follows: as purchased, refuse 50, water 44.8, protein .3, carbohydrates 4.6, ash .3, heat units 90. *Edible portion:* water 82.9, protein 6, carbohydrates 4.6, ash 3, heat units 90.

Nutmeg melon is a variety of musk melon. No analysis given.

Melons are to be classed as relishes.

TURNIP

The fleshy, globar, edible root of Brassica campestris; variety Rapa of the Cruciferæ or mustard family. Known to the Romans and Greeks and mentioned by Pliny and Columnella. Used extensively for food for man and cattle.

Good: In moderation. *Bad:* If fed exclusively or in excess.

Condition of feeders: Makes a great difference; they must be well adults.

Morphology: They are somewhat semi-solid, with a tough, fibrous (pitted ducts), leathery, mild, aromatic substance; the substance cells are large and small, usually globose, walls thin, inside clear protoplasm with nucleus and nucleolus which iodine colors yellow. The colloid protoplasm is in some scant and others filling up the cells; in the latter case, when cooked, the protoplasm is contracted, leaving clear spaces between it and the concave walls of the cell and also colored yellow by iodine. No starch found. The fabric is rather dense and tough.

Chemistry: United States Government analysis as purchased: refuse 30, water 62.2, protein 1, fat .1, carbohydrates 21, ash 1.8, heat units 625. *See also* page 124.

Physiology: Parr says: "Turnips are to many an agreeable food, but to watery and flatulent weak stomachs inconvenient. The yellow turnip has a sweeter and more mucilaginous taste and is apparently the most nutritious." (Does sweetness and mucilaginous taste make a food nutritious?) We trow not; nutritious food may be sweet, but all sweets are not nutritious, because they do not meet the chemical and practical tests. Cogan says turnips nourish much if they be first well boiled in water and afterwards in the fat broth of flesh and eaten with pork or beef. No doubt they need much boiling to soften the dense fibrous tissue and make their nutritive elements digestible. Properly cooked, admirable food for rickets and fractures.

Disease: They can be fed on solely for only about seven days.

Manifold food: In soups and with other food. A New England boiled dinner is generally corned beef, with potatoes, turnips, parsnips, etc.

Cures: Not much, save sparingly with other foods in scurvy; are too hard of digestion as usually cooked.

Head, heart, eyes, bone, hair, nails, teeth: From the chemist's standpoint good, but bad from the physiological difficulties of assimilation that ordinary cooking does not wholly remove.

Intestines: May cause much trouble.

How often used: Should not be often.

Force: According to the chemist, yes, but because of the difficult digestion, no.

Natural: Yes and eaten raw sometimes. Sometimes turnips taken from the field may be eaten raw with impunity because of out-of-door exercise.

Aesthetic and fashionable: Are not beautiful but homely.

Builders of tissue: If assimilated, splendid.

Fermentation: Very liable to it, because of their hard and resistant tissues and their tendency to lodge in the bowels.

Parasites: 1, a louse, aphis, raphæ; 2, flea beetle, P. striolata, United States; 3, turnip flea—jack fly, a muscid fly, Anthomyia radicum, whose maggot bore in roots; 4, saw fly, Athalia centifolia, larvæ devours turnip leaves; also subject to fungi if not properly fed with soluble mineral food.

BEETS

Belong to the goose foot family, eighty genera, five hundred species. The pig weed or goose foot weed are common. The common beet here referred to is Beta vulgaris, cultivated in the United States as the mangel wurzel. Used as a table food, to make sugar and cattle feed. Parts used are the leaves and root; there are more than forty varieties cultivated in the United States. Mentioned by Pliny. Dioscorides names the wild beet, Limonium. Parr says it grows on the sea coasts of England and Holland. Varieties are distinguished by their color more than properties. M. Achard, about 1800, attempted to extract sugar with a little success; now it is a staple production.

Good: Not very.

Bad: Rather, as beets could not be lived on alone very long.

Condition of feeders: Well adults with strong digestion.

Morphology: Is globar with tapering central axis root; feel is dense and harder than that of turnips; has the usual substance cells, with connective fibers and spiral tissue sap vessels, etc. There are spots of dense fibrous tissues that feel hard and correspond with the lignin of date stones. Beets are therefore hard food to digest unless properly cooked.

Chemistry: United States Government report, edible portion, average percentage: water 87.6, protein 1.6, fat .1, carbohydrates 9.6, ash 1.1, heat units 210. As purchased: refuse 20, water 70, protein 1.3, fat .1, carbohydrates 7.7, ash .9, heat units 170. Saccharose or cane sugar is also found in beets; sugar maple and sorghum. The sugar in beets is about ten per cent peligot.

Physiology: Parr says its juice is an errhine that causes a flow of the nasal excretions without sneezing. The dense physical properties of the beet render it difficult of digestion.

Disease: All the usual functional and organic changes that come from indigestible fermenting foods.

Sole food: About seven days.

Multiple food: In New England boiled dinners and as a pickle in vinegar.

Cure anything by feeding: We know not.

Head food: Not much.

Heart, eyes, bone, teeth, hair, nails, intestines: Ranks as all indigestible foods even when rich in mineral elements.

How often used: Should be rarely.

Heat: A poor show in this line, as wheat starch averages 1710.

Force: Not much. *Climate:* Temperate.

Natural: Never eaten raw, but are boiled until soft, as foods and pickles.

Fashionable: Mostly because of looks.

Builder of tissue: Not much.

Fermentation: Are liable to it because of its sugar and also its tough tissue.

Parasites: A small fly, Anthomyia betæ, whose larvæ eat the beet leaves.

Intemperance: We know of no cases of intemperance in the eating of beets.

PARSNIP

Pastinaca sativa or *Pecedanum sativum* is of the Parsley family; is used as a culinary vegetable and fodder for live stock; European in origin; mentioned by Pliny, also Dioscorides, Galen and Mathias. Used extensively in the Southern States.

Good: Compared with wheat no.

Bad: Easily made so as it is hard to digest.

Condition of feeders: Must be well and best for out-of-door laborers.

Morphology: Root the part used, which is large, spindle shaped and light colored.

Chemistry: United States Government report, edible portion, as purchased, averages: water 79.9, protein 1.7, fat .6, carbohydrates 16.1, ash 1.4, heat units 355. As purchased: refuse 20, water 63.9, protein 1.3, fat .5, carbohydrates 12.9, ash 1.4, heat units 285. Pastinacea opopanox has been analyzed further, and as it gives an idea of what might be found in Pastinaca sativa it is here given. The juice is had from the base of the stalk of the root and dried. Chemically it is a gum resin with other ingredients. Pelletier gives the following percentages: gum 33.4, resin 42, starch 4.2, extractive 1.6, wax 0.6, malic acid 2.8, lignin 9.8, volatile oil and loss 5.9. Traces of india rubber.

Physiology: Cogan says they are diuretic and carminative; Galen calls them restorative. Their dense structure makes them hard of digestion and they need much boiling and after boiling to be fried. Parr says they are very nutritious.

Disease: Is that of marked indigestible foods, gas and colic.

Sole food: Do not know, probably not many days if even parsnips could be fed on one day.

Manifold food: Yes, always and in very small proportions as a relish.

Cures: We know of none.

Bones, hair, head, heart, eyes, nails, and teeth: Only good as a relish and not as the substantial part of the meal.

Intestines: Not good because of toughness of interstitial substance.

How often used: Rarely in these days. In Cogan's time, the common people in England used parsnips as meat in autumn and specially on fish days.

Force: Difficult to get any, save in out-of-door laborers.

Climate: Temperate. *Natural:* Yes.

Aesthetic: The peculiar flavor of parsnips is agreeable to many.

Builder of tissue: If eaten in small quantities so as not to interfere with digestion and assimilation.

Fermentation: Like all other hard to digest vegetable foods.

Parasites: Parsnip web worm, Depressaria heracliana, the caterpillar of a European moth now widely distributed and destructive to the flowerheads and roots, and of other plants besides.

Intemperance: Possibly, but have observed none.

Proper place for parsnips as food: Feeding stock who can eat them raw, as they have stomachs adapted to them; possibly if man when weaned was obliged to live on raw parsnips he might get used to them, but the Digger Indians in California, who are said to dig and live so much on raw roots, are not such specimens of humanity as to commend the general use of raw roots.

What caution should there be about the wild parsnip: Pastinacæ sylvestris. It may be mistaken for the sativa or garden parsnip, but eaten its roots cause a painful heat in the mouth, soon followed by thirst, the pupils gradually dilate, sight is lost, and delirium comes on. When discharged by vomiting these symptoms abate, but the dilatation of the pupil is the last symptom which disappears. Boiling makes wild parsnips harder and the good softer; an easy test added to that of the taste.

CARROT

A cultivated variety of the Parsley family, reddish yellow and spindle shaped, not produced the first year by the Daucus carota, a biennial which in the wild state is a widely naturalized noxious weed with white root; mentioned by Pliny. Cogan classes carrot with parsnips as food. Galen thinks them better food than parsnips; has been used as food for ages.

Good: Not very. *Bad:* Because it is a tough root.

Condition of eaters: Only the strong and well may eat them; the sick and feeble never unless fully cooked.

Morphology: The cultivated carrot is hard, reddish, fleshy, thick, tough, conical, rarely branched, smell pleasant and with a peculiar sweet mucilaginous taste. Boiled it becomes tender and not very flatulent (Cogan).

Chemistry: United States Government report, percentages, as purchased: refuse 20, water 70, protein .9, fat .3, carbohydrates 7.4, ash .7, heat units 175. Edible portion: refuse 83.2, protein 1.1, fat .4, carbohydrates 9.2, ash 1.1, heat units 210. Wood and Bache give carrots constituents as follows: sugar crystallizable and not; starch, saline matters, extractive, gluten, albumin, volatile oil, vegetable jelly or pectin, malic acid, liguin, and a ruby red crystallizable, odorless, tasteless principle called carotin. Braconnot discovered and named the vegetable jelly pectin. It is abundant in fruits and vegetables more or less. *See also* table page 124.

Physiology: The dense texture renders carrot a hard food to digest, unless carefully cooked and eaten in small amounts as a relish. For cattle it is all right.

Disease: In large amounts and often eaten, carrots must only become sources of disease changes.

Sole food: We do not know, but judging from experiments that have been made, only for a few days.

Multiple food: Used to flavor soups and as a relish with other foods; also in vegetable hash.

Cures: They are noted as medicine in the Edinburgh Pharmacopœia, 1854, raw, as poultices for bad ulcers. The root is prepared by scraping and is an active stimulant from its oil, also used boiled soft. Galen deemed carrots better than parsnips as a restorative. The wild variety seeds are used as a medicine in chronic kidney disease and dropsy. Their aromatic properties adapt them to the stomach as a cordial.

Head and heart: Good only as a cordial.

Eyes, bone, hair, nails, teeth: The chemical elements show them to be good for these organs, but the barrier is their difficult digestion.

Intestines: Must be eaten with caution, otherwise will ferment.

Force: Not much.

Climate: Temperate.

Natural: Save from the changes made by boiling.

Fashionable: As a relish.

Builder of tissue: If assimilated, which is doubtful.

Fermentation: Liable to it.

Intemperance: Very possible, because they can so readily upset the bowels. Those with delicate digestion should best use them as a flavor to soups.

CABBAGE

Brassica oleracea. The popular American varieties are curled, drum head, Savoy, Mammoth drum head, Stone mason, red, Dutch, etc. Belongs to the Mustard family; Cruciferæ: name derived from Cabocha—old French. Mentioned by Cicero, so it has long been known and used largely to-day, specially by the Germans as sour krout.

Good: Not very, save as a relish. *Bad:* Yes, unless carefully used.

Condition of feeders: Must be grown, strong and well; not good for others.

Morphology: Is loose in structure, generally somewhat tough and hard to digest unless thoroughly cooked. Specimen cooked showed the usual morphology, save stomata; the fibrous tissues abundant; substance cells small, diaphanous, clear, delicate; spiral tissues large; cell contents clear.

Chemistry: United States Government reports, edible part: water 94.3, protein 2.9, fat .7, carbohydrates .08, ash 2.7, heat units 225; as purchased: refuse 15, water 70.8, protein 1.8, fat .3, carbohydrates 4.9, ash 1.2, heat units 140. *See* table page 124. Compared with wheat cabbages chemically fall as follows: *water,* cabbage has 94.3, wheat has 10.4; *protein,* cabbage has 2.9 per cent., wheat 12.3; *fat,* cabbage has .7, wheat 1.7; *carbohydrates,* 8 per cent. in cabbage, 75 per cent. in wheat; *ash,* cabbage has 2.7 per cent., and wheat has .9; here a line where cabbage excels wheat. *Heat units:* cabbage 225, wheat 1.685. *Composition of sour krout,* United States Government report: water 86.3, protein 1.8, fat .8, carbohydrates 4.4, ash .7, heat units 145.

Physiology: Parr says that "cabbages are supposed to have a stronger tendency to putrefaction than most other vegetables, as in putrifying they exhale an offensive odor, that much resembles that of putrifying animals (probably sulphuretted hydrogen). Therefore it seems reasonable to believe they are easily digested and hence very nutritious" (this is by no means true). Dr. Galen says "all of them may be considered as supplemental provision only and are seldom chosen by the quantity of nourishment they afford but by the tenderness of their texture and the fulness and sweetness of their juice." In general they are flatulent and inconvenient in well stomachs.

Physiology: Cabbages are far from being unsalutary. They neither induce nor promote a putrid disposition in the human body, but on the contrary they loosen the bowels and produce much flatulency (when improperly cooked). Boiling destroys their laxative quality.

Disease: The blackness and odor found in decaying cabbage is due to sulphuretted and phosphuretted hydrogen; there is no wonder that cabbage is laxative, for the solar plexus of nerves, to get rid of the offending gases, causes downward peristalsis to eject the offenders. There is considerable difference between normal peristalsis and irritative peristalsis; one is not exhaustive, the latter is; so cabbage would lessen rather than increase the sum of vital forces and if long continued would bring on the disastrous results of baked beans herein cited. The fact that cabbage generates gas so speedily indicates that its disease effects would be felt sooner than that of beans. We should look for catarrh, colic, neurasthenia, sometimes making patient act as if drunk or in acute locomotor ataxia.

Sole food: We know of no such trials having been made lasting over one day; probably not over seventeen days.

Multiple food: Always, eaten for the flavor and feeling under the teeth.

Cures: Taken in moderation anti-scorbutic; furnishes lactic acid that acts like citric acid.

Sour krout is made as follows: Cut the cabbage into thin slices, put them in a cask (cleaned, dried and lined with leaven); on each layer sprinkle a layer of salt and press down; when the cask is full and the liquor drained off, cover with a clean cloth, then lay on a loose cask head and weight it for continued pressure. Let it stand in a warm room until it ceases to ferment, then use by boiling in water for two hours or more, pour off the liquor, add butter and eat as other vegetables.

Heat: As an anti-scorbutic, in moderate quantity, cabbage may be good for the head, but certainly bad when it evolves gases in the intestines.

Heart: Not good because of its easy fermentation in the alimentary canal and its inability to sustain life as sole food.

Eyes, bone, hair, nails, teeth: The very high amount, seven per cent., of ash renders cabbage a fine food for these organs, could it be assimilated. While it does not have the textile density of the conventional bean, still its indigestibility is against the high chemical character as food, and must be considered by those who are after the above organs existing in normality.

Intestines: Is bad unless very carefully cooked and eaten in small amounts.

How often used: Practically not more than once a week by the average American; would sicken on it if used daily.

Heat units: 225 against the 1800 of sugar shows cabbage to be low in this respect.

Force: Had our Government given the percentage of the composition of the ash of cabbage (which is large) of seven per cent. we might judge more of its force powers. But here again we meet the bar of indigestion, so that the only way to find out the force of cabbage is to feed men solely on it and set them to work; one thing is quite certain, however, that the amount of force lost in digestion and assimilation of cabbage would be so great as to diminish much the amount of force actually assimilated. A commercial business for profit is usually estimated by the gains, rather than by the amount of business done.

Climate: Temperate. *Natural:* Yes, as sometimes cabbage is eaten raw.

Aesthetic: Not much, save the taste and flavor. It is not a spectacularly beautiful fashionable food and its odor is decidedly unæsthetic.

Builder of tissue: Not much if eaten in small quantities and is difficult in large quantities to digest.

Fermentation: The fetid odor of decaying cabbage points to a peculiar fermentation, not the common alcoholic nor vinegary, but the lactic acid alcohol and vinegar fermentation combined in the evolution of sulphuretted and phosphuretted hydrogen. We believe that the intestines of large sour krout eaters could be made to furnish lactic acid alcohol.

Parasites: (1) cabbage aphis, plant louse, Aphis brassicæ; (2) cabbage beetle or flea, Phyllotrata vittata; (3) cabbage bug, a brilliant colored pentatomid, Murgantia histrionica, from Central America to the United States; (4) cabbage butterfly, Pieris rapæ, European export; (5) cabbage fly, a muscid Anthromya brassicæ, whose larvæ (maggots) feed on the roots; (6) cabbage moths, (A) Mamestra brassica, (B) Plusia M, (C) Plutetta cruciferarum; (7) cabbage worms, larvæ of said flies. Cabbages are thus very much preyed upon.

GRAPE

Genus-Vitis, many species; extensively cultivated for eating and making wine and raisins. Many of the United States varieties, as the Isabella, Catawba and Concord, are from the wild northern fox grape, Vitis labrusca; others as the Scuppernong are from the southern species, Vitis vulprina. The hundreds of Old World varieties are the Vitis vinifera. Some of these have been successful in the United States and the American Pomological Society looks to development of our native grapes for successful culture.

Raisins are dried grapes containing much sugar, cured in the sun or oven, used in dessert or cooking; known as seedless Sultanas, large or ordinary, and currants or corinth raisins. Raisins come chiefly from the Mediterranean and California. *Wine* is the fermented juice of the grape, called "dry" when there is little or no sugar, and sweet when the sugar is plainly perceptible to the taste; some one hundred and sixty-four varieties of wine are given as a partial list in the Standard Dictionary. *Must* (Latin Mustum-new) is the expressed juice of the grape sweet and unfermented;

new wine. Grape use dates back to 2348 B.C., and is mentioned as wine in ancient histories. We will here treat of grapes and raisins and must consider wine later, under Alcohol liquors, with special note on *Must.*

Good: As dessert and some consider for chronic diseases. All mankind agree to their use when perfectly ripe, newly gathered or kept a few days (and not sometimes). They are thought thus to nourish better and be less laxative.

Bad: Not if properly used, and in accordance with common sense.

Condition of feeders: Well people, though as seen above some convalescents might use them.

Morphology: Grapes are usually globar, or obovoid; have, when ripe, a thick skin of varying colors, black, purplish, green, etc., soft and elastic to the feel. The inside of the grape skin is soft, velvety, of a reddish color, and this part put under the microscope is a most interesting object with its prismatic crystals of sugar and its fine acicular or needle crystals of cream of tartar, free or aggregate and specially in large bundles inside the cells of said pulpy skin., In the skins there are glands, that secrete a beautiful odor that is very æsthetic and attractive, called sometimes the bouquet of grapes. The grape pulp proper is quite large comparatively and has for its center a collection of seeds; over these is enveloped a mass of greenish white stiff jelly like substance that has no particular form but seems to be, as it were, glued together; these central masses of grapes when bitten are bitterish, a little acrid and astringent, reminding one of tannin. The grape tissues are not very tough; the juice includes the watery portion of the skin and pulp and is not separated for eating.

Chemistry: United States Government report, grapes ground and dried, as purchased: water 34.8, protein 2.9, fat .6, carbohydrates 60.5, ash .2, heat units 1,205. The

Vitis vitifera (European) contains malic and tartaric acid, racemic acid, called by Berzelius para tartaric acid from its resemblance to tartaric acid. Its chemistry varies with soil and climate, and the varieties from culture and situation are innumerable. It also contains sugar; probably the sugar in the above analysis makes up the bulk of the 60.5 of carbohydrates. This sugar is grape sugar or glucose and deserves an extended notice. Formula C6 H12 O8, found besides in the juices of plants and honey along with levulose or fructose; granules of glucose separate from the juice of grapes in drying; is found in malted grain and made from starch by the action of sulphuric acid. Glucose is also the same as liver sugar; long boiling of the watery solution of cane sugar with dilute acid will produce glucose. Found in molasses and honey dew, Syrian and Kurdistan manna and in wheat. Glucose is not so sweet as cane sugar or saccharine. In Portugal, the deep colored grape, Tinta francisca, yields sugar twenty-four per cent. of Must weight, like the tonriga, and the white delicious perfumed verdello grape, twenty-two per cent. sugar of Must weight. *See also* page 124.

Physiology: Pleasant and grateful to the taste when ripe and refreshing to those with febrile complaints. Largely taken, they are laxative and diuretic from the bitartrate of potassium or cream of tartar. They have always been regarded as nourishing. Galen proved by experience that vineyard keepers feeding only on grapes and figs for three months became very fat, but the flesh so gotten soon wears away again, because it is not firm and fast, but loose and over-moist, and naturally so because sugar is a carbohydrate and fat is also a carbohydrate.

Destruction of tissue: Not exactly, according to Galen, when he notes that grape eaters grow fat and waste with time but practically so.

Sole food: In the grape cure for chronic diarrhœa the sick have been represented as living on them from one to three months. We knew a man who tried it and could not live on them but for a month, and hardly that time.

Multiple food: Generally at the close of the meal. They are often kept on the table and eaten between meals.

Produce disease: Grapes if freely fed on will produce flatulence and its consequent troubles. Appendicitis has been often laid to grape seeds, justly in some cases; but we think such cases are rare. If the appendix is in a normal condition, the grape seeds are tolerated, as it will push same into the bowel.

Cures: So said in the grape cure, and there is no doubt of its truth in certain chronic cases. A matter of judgment on the part of the physician.

Head and heart: Good in health.

Bone, eyes, hair, teeth, nails: The 1.2 per cent. of ash is favorable for these organs.

Intestines: Particularly good for them as testified by same in chronic diarrhœa or constipation of the bowels. It may be because of sole feeding. Other things being equal the system will thrive on few articles of food for a time, better than on many.

How often used: Ethics allow them at one or two meals a day through their season for well people. It is a common custom to eat them at breakfast, though we believe them to be better borne if eaten after a meal.

Heat: 1,205 high up. If grapes are a fall and summer food why should there be so many heat units for the hot weather? People eat them for their cooling properties.

Force: We have found considerable in grapes which comes from the protein, 2.9.

Climate: Mild and hot climates.

Natural: Ripe grapes are very natural food and always eaten raw. Unripe or green grapes are cooked into stew, jelly or sauce.

Aesthetic: Peculiarly so.

Religious aspect: Wines new and old have been objects of much religious condemnation and penalty. These will receive notice later. Grapes are not often mentioned; one instance is specially remarkable for the size of one cluster of the grapes of Eschol which the Jewish spies brought to show the fertility of Canaan, and there are other witnesses to prove that the grapes of this region grew to this great size; even now this incident was a great item in the history of the Jews' religion.

Builders of tissue: Largely of fat.

Fermentation: See Alcohol and Must.

Parasites: (1) grape curculio or weevil, Cæliodes inequalis; (2) a gall making curcurlionid, Banidius seostris; (3) fungus, Oidium Tuckeri, mold or vine mildew; (4) grape hopper, Etrythroneura vitis; (5) grape leaf blight fungus, Cercospora viticola; (6) grape leaf spot, thought to be conidia Læstadia Bidwellii, black rot fungus; (7) grape louse, Phylloxera; (8) mildew, Peronospora viticola downy; (9) powdery mildew, Uncinula ampelopsidis; (10) grape moth, Eudemis botrana larva; (11) ripe rot, Gleosporium fructgenicum; (12) bird's eye rot or anthracnose, due to Sphaceloma diplodiella; (13) white rot, due to Coniothyrium diplodiella. (14) widely destructive black rot, due to Læstadia Bidwellii. Surely this list from the Standard Dictionary is enough to show the attention of mankind given to the plants and animals that prey on grapes, whose cultivation furnishes a livelihood to many people.

Intemperance: Have known of collegians glutting themselves with *borrowed* grapes; little ill effects.

MUST

The juice of the grape, fresh, unfermented, is practically a liquid form of grapes and may be considered as food, in so far as grapes are food. Some think that Must should not be called wine, which means the fermented juice of grapes; then of course unfermented wine is a misnomer. From the universal presence of alcohol and vinegar yeast plants in the air and their presence on the outside of grape skins it cannot but be that alcohol plants must be in the Must ready to act under the environments of temperature and of air that has more or less of alcohol plants in it, but when air is excluded or the Must is boiled down to *stum* (must spelled backwards) then it remains as Must and is sold to-day at thirty-five cents a pint for communion purposes in New York City, or two dollars and eighty cents a gallon, which certainly is a good price for grape juice.

Religion: The last paragraph shows the value of Must for religious purposes. The religious world has been from time to time stirred with the question of using wine at communion, some arguing against it and using the Must, which as said before is sweet, and called glukose, but the new wine is in Acts applied to a more saccharine and therefore inebriating fermented wine, hence those who use the term Must or new wine should remember that philologists are not always any more particular than botanists, who include a vast number of grapes, all under one term, Vitis Unifera, and those who insist that Must should be used at communion may remember that it was Oinos—wine fermented, that the Saviour used at the Passover communion and made at Cana in Galilee. The word wine occurs in the New Testament thirty-seven times, Oinos occurs thirty-three times, Glukos once. In the Hebrew Bible "new wine" occurs twenty-seven times, and Tiyorosh, fairly fermented wine, occurs one hundred and seventy times, so that on the ground of Bible usage fermented wine is meant; indeed Must is mentioned but once in the New Testament.

Is Must used much as food: Not in the United States; most prefer to have the grape fresh from its receptacle inside the mouth; it is more cleanly than when trod by the foot; we doubt if Must is used much as a drink anywhere, save for religious purposes.

Must is prevented fermenting by the use of sulphur and sulphur compounds; the bisulphite of soda added to apple wine—cider—kept it, but its flavor was like that of sulphur springs, that is of rotten eggs; hence the alcoholless apple wine was not a success save as a mode of administering sulphur as a medicine.

Is Must difficult to make: No.

Why then pay such high prices for it: We know not.

Does not Must readily ferment: Yes, when exposed to air.

Advantages: Can be drank as a liquid when it is hard for a solid to be swallowed; prevents danger of appendicitis by being seedless; is more convenient for transportation; has all the good of grapes in an easier form.

WINE

Is fermented juice of the grape and is distinguished by the alcohol it contains. (*See* Alcohol.)

CRANBERRY

Crano or Moor Berries. The American Vaccinium macrocarpon and not the small cranberry; Vaccinium occycoccus is meant here. Grows from North Carolina to Minnesota and northward. Belongs to the Huckleberry family, Vacciniaceæ, which has twenty-seven genera and about three hundred and fifty species. Cranberries are not mentioned by this name in Roman history, and as the European cran berry is small and so much inferior to the American, that large quantities of the latter are exported to England, it is probable that they came into general use as a sauce or pie or relish during the last three hundred years. The name indicates them as food for cranes. The high value, ten dollars per barrel, shows the estimate put on them. Are a relish food.

Good: Moderately, as a relish.

Bad: Enough not to use in cases of chronic disease.

Condition of feeders: Festive occasions, especially on Thanksgiving or Christmas. They should be well and in condition to feast on the menus of these days.

Morphology: When ripe it is a red berry, round or roundish, half to five-eighths inch in diameter; it has some resistance to the touch but collapses under pressure, like any globe with thin walls; its tissues are loose; its substance cells are different from almost any other fruit. Re-entrant angles unique.

Chemistry: United States Government report, average of two samples, as purchased: water 88, protein .5, fat .7, carbohydrates 10.1, ash .2, heat units 225. There must be a peculiar acid, which gives the taste, and it is not the pectic, which must be largely present, as all cooks know how well cranberry jellies. Contains citric acid and used for the manufacture of that acid (*Jour. de Pharmacie*, 4 ser., v. 18).

Physiology: Agreeable and appetizing and digests readily, acts somewhat like lemon (citric acid), and appears to meet a physiological want of the digestive organs.

Destructive of tissues: Not to a great extent.

Sole food: We know not for men; cranes probably can live on them a whole season; it is quite certain that man cannot.

Multiple food: Always as a relish. In winter, skating and hungry, frozen cranberries are found very grateful and satisfying for a short time. They are usually made into sauce, jelly, pies, and a good deal of sugar is used with them, so that the eaters taste the sweet acid more than the sour. Sugar as an acid unites with lime to form the saccharate of lime; we have known the latter to be so strong as to take the skin off the tongue. When the Revere House, Boston, was built many years ago, hogsheads of molasses were put into the mortar, which made the brick work a model one.

Produce disease: No doubt if used in too large a proportion and solely.

Cures: As a relish against scurvy.

Head and heart: Not directly but indirectly in assisting digestion.

Bone, eye, teeth, nails, hair: Not much nourishment for these in two-tenths of one per cent. of ash.

Intestines: In *small quantities* they benefit the intestines by their peculiar acid to aid the liver and otherwise as an anti-scorbutic.

How often used: Practically in the fall and winter months.

Heat units: 225 is a small number, and if one were after heat they would select some other kind of food.

Force: Not much beyond the stimulus of the fine acid relish.

Climate: Temperate.

Natural: Custom does not interfere with cranberries, save in the application of heat and sweets in cooking.

Aesthetic: Yes for its taste, but probably adopted by the fashionable world because of its lovely red color.

Religion: No special significance.

Builder of tissues: No.

Fermentation: Not when used as a relish and properly prepared; the carbohydrates are in such small proportion that they cannot make much fermentation unless abused.

Parasites: (1) cranberry leaf roller, Anchylopera vacciniana, whose larvæ, called cranberry vine worms, are destructive; (2) cranberry moth, a leaf crumpler, Acrobasis vaccinii; (3) cranberry wevil, Anthonomus suturalis, destroys the buds. Note.—Cranberry culture is a most important industry on Cape Cod, Massachusetts. Schools are closed in the season and most every one that can be spared engage in picking at high prices.

FRESH CUCUMBER

Cucumis sativa. A genus of the gourd family, eighty-six genera, about six hundred and thirty species; goes with the pumpkin, squash, musk melon, etc.; earliest mention made in Egypt, 116-125 B.C., by the most learned of all Romans, Varro. The Bible mentions it twice. Not found in Cogan. It makes a considerable portion of the food of many persons in warm climates and seasons.

Spiritual food: No, but they made a great difference to the Jews' spiritual kingdom, Numbers 11:5.

Good: Can hardly be called a good food, whose name in the Hebrew is derived from a word meaning hard to digest, "qishshu," and this is so even if the Egyptian cucumber is much better than the present conventional one.

Bad: Certainly, if it spiritually caused deaths to the Jews aforesaid and has certainly caused many acute cases of colic, cholera morbus, collapse, diarrhœa and sometimes physically death.

Condition of feeders: Must be adults, strong, well, hearty out-of-door workers, not eating them when tired, overworked nor out of meal times, hence children should not eat them at all.

Morphology: The tissues are white fibrous, not very spongy, leathery, elastic, resisting the knife that cuts them up, specially the rind. The skin is tough, prickly, tuberculate; usually they are solid all the way through, even when ripe. They have no cells like water melon, oval, oboval, and filled with amœbic protoplasm; they deserve their Hebrew name.

Chemistry: United States Government reports, as purchased: refuse 15, water 81.6, protein .7, fat 2, carbohydrates 2.1, ash .4, heat units 60; water and refuse make up 96.6 per cent; not much nourishment shown by this analysis. *See also* page 124.

Physiology: There is a greenish juice in cucumbers, of a peculiar flavor, which makes the relish; its substance digests slowly and occasions acidity and flatulence, especially in weak stomachs. The Egyptian cucumbers were usually one foot long and greener, smoother, softer, sweeter and more digestible than ours; they were esteemed delicacies, hence the Jews had some foundation for their longing taste in the wilderness. The qualities are watery and cooling for summer food; the fresher the better.

Disease: They rapidly deteriorate and wilt by keeping, lose their crispness and then impede digestion, and this gives the yeasts a chance to turn them into gases, alcohols and vinegars; these in turn produce diarrhœa, etc.; palatable and appetizing foods are not necessarily healthy.

Sole food: Do not know. It is said that in Egypt they form a great part of the food of common people during the summer months, but our cucumbers are not so good as theirs. There is not enough nourishment in them to keep up active life for many days.

Multiple food: Always in civilized life.

Cures: Never heard of any; far oftener the other way. (*See* Skin.)

Bone, hair, head, heart, nails, teeth: How can they be with only 4 per cent. ash and 96.6 per cent. water and waste. They are relishes and poor ones at that because of this poverty and because they ought to be eaten, if at all, fresh from the vine or kept on ice, save as pickles.

Intestines: They are hard for same.

How often used: Very rarely and then only by the well and hearty.

Heat: low proportion.

Force: Not a force producer, but a user of force to digest it all out of proportion to its usefulness.

Climate: Warm climes like Egypt is where they flourish; no so developed in temperate climates and thus not so good to eat.

Natural: Decidedly, never knew them to be cooked, but always used raw with vinegar and salt.

Aesthetic: Yes to the taste, smell and sight, but for this few would be eaten. Found on the table of fashion ("cool as a cucumber" is a proverb) they are cool and moist certainly, especially when iced.

Builder of tissues: Very little.

Effect on the skin: Cucumber juice is the basis of cucumber ointment for irritation of the skin, and works well.

Fermentation: Decidedly liable.

Parasites: (1) a black beetle, Crepidodera cucumeris, whose larvæ devour the leaves; (2) the squash beetle.

Intemperance: Probably there is more intemperance in eating cucumbers that comes under the notice of the medical profession than of any other vine fruit used as food. Eaters use them against their judgment and are willing to run the risks, but often do they regret the disturbance to the nervous apparatus when it is too late.

CUCUMBER PICKLES

They are generally the half-grown fruit of cucumber vines soaked in brine vinegar along with spices and sometimes with sugar. Pickling preserves the cucumber in a more solid condition and are used as flavors and relishes.

Chemistry: United States Government report: water 89, protein 5, fat .5, carbohydrates 5.4, heat units 130, ash 4.6.

Good: From a chemical standpoint, on account of the ash, and this alone.

Bad: Because of the hard, tough structure.

Condition of feeders: They should be of the strongest constitutions.

Physiology: They offer hard problems in physiology though the vinegar in small quantities probably acts on the liver like other acids. Their denser structure makes them even harder to digest than the fresh raw cucumbers, although the immature are less tough than the mature.

Sole food: Probably not over one day.

Multiple food: Always.

Produce disease: Constipation, then diarrhœa, colic, flatus, and if pushed, dysentery.

Cure by feeding: We know of one case of dyspepsia who had consulted physicians here and abroad and finally was cured by eating pickles on the advice of the late Gr. Gross. It seems to us that the cure was the natural result of the visits to Europe and the rest, and that it was synchronous with the use of the pickles.

Bone, hair, nails, teeth: 4.6 of ash is good for these organs, but how can it be assimilated from tough pickles.

Intestines: Bad for them unless in very small quantities.

Heat: Too small to be sought for. *Force:* Little.

Climate: Are used in hot and cold climates and are put up so as to be readily carried and kept for use where they are not grown. We have seen huge hogsheads of pickles brought to this country from Holland and bottled to go all over the world from New York.

Aesthetic and fashionable: They certainly are in good form for society use, but they are eaten largely by the general consumer.

Builder of tissue: No.

Pickles from ripe cucumbers: They are tenderer.

Fermentation: Pickles may be said to be in the stage of vinegar fermentation as they are soaked in vinegar; if so, their next stage must be one of decay. Cider that has gone through with the alcohol and vinegar fermentation is disagreeable to sight and almost so as to smell, as the decay is a charnel house.

Intemperance: Are subject to the language as used for cucumber intemperance.

Dr. Parr says of pickles: They are little more than vinegar in its most inconvenient and indigestible form, also that no diet is particularly inconvenient to the robust; (we add) unless they make it a sole food as we have seen.

Unripe melons, unripe walnuts, sliced beet root, etc., are also used to make pickles with vinegar and are classed with cucumber pickles.

PEPPER, BLACK

Piper nigrum. One form of condiment; mentioned by Horace and Celsus before the Christian era; not mentioned in the Bible; came from India originally, but now from Java, Sumatra, Malabar; belongs to the Piperaceæ that has two tribes, eleven genera and one thousand species. Universally used.

Good: Yes; it is allowed in chronic diseases.

Bad: If used carelessly, like an edged tool.

Condition of feeders: Both well and sick.

Morphology: The dried berries are like a small pea, outside blackish and wrinkled, inside whitish. *Specimen* from hotel table: oil globules, reddish amber like plates, masses of some cooked cereal blackened by iodine. *Starch grains* in masses looking whitish like manna or gum tragacanth; soaked in water both masses broke up into very numerous small spore-like bodies 375 x and less than half the size of red blood corpuscles (man); some were saltatory and automobile like oil; the one-sixteenth, one-fiftieth, and one-seventy-fifth inch objectives showed they were not oil but some irregular, some regular hexagons—tetragons, some globar, some with inside focus, some with nucleus—off focus this disappeared. The sexagons had most marked outlines and nuclei, some were with raised margins like dried red blood corpuscles. Grains single, aggregated, massed, color nacreous, yellowish white; no automobility with high powers; Lugol's solution stained these bodies all dark purple; probably these are the smallest of all starch grains; remarkable.

Chemistry: Pellitier found piperin; a peculiar crystal, an acrid concrete oil or soft green resin, a balsamic volatile oil, a colored gum, an extractive like that in beans, bassorin, uric and malic acids, lignin and salts. The formula for piperin is $N_2 C_{70} H_{37} O_{10}$; it is doubtful if it is the source of activity, which lies more probably in the resin and volatile oil; the resin or concrete oil is of a deep green color, very acrid, and soluble in alcohol or ether; the volatile oil is limpid, colorless, but ages yellow, of a strong odor and less acrid than the pepper. (Wood and Bache.) No Government analysis.

Physiology: A warm carminative stimulant, producing general arterial excitement, but also acting with greater proportional energy on the part applied. Parr credits the stimulus to the resin, not the oils. It is the safest spice to warm the stomach and enable it to perform its office more properly.

Disease: It has been known to kill in some instances in large doses; excites congestion.

Sole food: Never.

Cures: Intermittent fever in drunkards, it is said; in colic, has been applied like mustard; used from the time of Hippocrates to excite a languid stomach and correct flatulence.

Head: Good only indirectly by helping digestion.

Heart: Stimulates, but not a food.

Eyes: Direct action is very painful and blinding.

Heat: Pepper is so heating that it is regretted we have no analysis for its heat to see how its actual heat compares with the physiological.

Force: That of the whip.

Climate: Natural to the tropics; pepper food better borne there than in the temperate climes.

Natural: Yes. *Fashionable:* But not very æsthetic.

Builder of tissue: No.

Effect on skin and mucous membrane: Irritates and inflame, if not blister.

Fermentation: Too much volatile oil, which prevents.

Parasites: Pepper moth, Amphidasis betularia, European, white speckled and streaked with black.

Intemperance: Rarely, as the sense of taste intensely rebels against such a thing; on the other hand, it is good for drunkards.

Holbrook's Worcestershire Sauce: This sauce the senior writer has found good and recommends it as a valuable table sauce used in moderation; the American substitutes have been found abominable.

Capsicum is of the Solanaceæ or nightshade family; the dried or green pods are the part used; native of the East and West Indies; species are numerous, cultivated in Europe and this country.

Physiology: Produces in the stomach a powerful sense of heat and general glow all over the body, but no narcotic effect; is is useful in correcting the flatulent tendency of certain vegetables and aiding their digestion; hence the value to natives of the tropics, who live chiefly on vegetable food. In the East Indies it has been used from time immemorial. Pliny refers to it; it is more powerful than black pepper.

Chemistry: Bracomet found its active principles to be capsicin, which resembles an oil or soft resin, of a yellowish or reddish brown color. Its taste, though at first balsamic, soon produces an insupportably hot and pungent impression over the whole of the mouth; heated it melts and at a higher temperature emits fumes, which even in very small quantities produces coughing and sneezing. The other substances are an azotized substance, gum, pectic acid and pectin (probably) and salts. It is sometimes adulterated by red lead.

Good: In the tropics where vegetable food is largely eaten.

Condition of feeders: Vegetarians need it most.

Morphology: The tissues of the pod are not very tough.

Disease: Applied to the skin produces congestion and redness and probably likewise in large doses in the stomach.

Cures: Neuralgia; useful to weak stomach and enfeebled digestion; delirium tremens; also valuable in some forms of hemorrhages.

Head and heart: Stimulates the heart and helps the heart and head by arresting the gases from vegetable tropic food.

Intestines: Good for them by preventing fermentation.

How often used: In the tropics is is constantly used with other food.

Heat: Capsicum is much hotter than black pepper.

Force: According to chemists, capsicum should be the most powerful food producing force, because of its heat.

Climate: The tropics, specially where there seems to be a greater tolerance of capsicum.

Natural: Decidedly, as it is used uncooked.

Aesthetic and fashionable: Its red looks well in the castor; it is not the red of the beet, the strawberry or cranberry.

Religion: No connection.

Fermentation: Prevents same.

Parasites: Do not know. It would be interesting to prove they were free from them on the ground of its acridity.

Intemperance: We know of no cases.

TABASCO SAUCE

It is a strong American Cayenne pepper sauce, very interesting under the microscope; the field is found full of minute whitish automobile granules which are probably oil; there are also large prominent dark red globules scattered through the field, some of which are encysted in the cells of the body substance, whose walls are clear like glass and render their contents visible. Some of the shapes inside were other than globar and were amœbic, like the fat found at times in the renal epithelia of fatty ills; the spiral tissues were well dissected and the cells corresponding to aleurone cells in wheat were very small; polarized light did not affect the oils, but did bring out here and there in masses of substance cells, the presence of large starch grains; the specimen examined appeared to be prime and genuine.

RASPBERRY

Rubus idaeus; also Rubus stringosus, wild red; Rubus occidentalis, black raspberry or thimbleberry. Distinguished from the blackberry by having the collective thimble shaped mass of drupe separable from the dry hemispherical receptacle. Rubus idæus mentioned by Pliny. Wood and Bache make no distinction between raspberries and blackberries. Parr says it is a native of Britain, with three varieties, red, white and smooth, and distinguishes them from blackberries, Rubus vulgaris, by the fainter taste and moderately agreeable flavor; but most persons know there is a well-recognized difference. Raspberries have a delicate flavor, tenderness of tissue, cool the palate, quench thirst and promote secretions. Our experience has been that they are the best berries for the sick.

Parasites: (1) borers, Caterpillar of Bembecia maculata; (2) the grub of a beetle, Oberea bimaculata; (3) slugs, the larvæ of a saw fly, Selandria rubi.

The wild raspberry is the best, having a flavor far exceeding the cultivated.

Used: As a dessert or mixed with water, sugar and vinegar or syrup as drinks.

Chemistry: United States Government reports: water 85.8, protein 1, carbohydrates 12.6, ash .6, heat units 255.

STRAWBERRY

Fragaria vesca. We are told that technically it is neither a fruit nor berry, but a large, fleshy conical or hemispherical receptacle bearing on its surface the seeds which are really the fruit. Mentioned by Virgil and Pliny.

Chemistry: United States Government reports: refuse 10, water 81.8, protein .9, fat .6, carbohydrates 6.1, ash .6, heat units 155. We can find no inorganic analysis, but this confirms the impression that strawberries are a very poor food to supply tissue waste.

Good: To give desire to the eye, to stimulate the palate when properly cultivated; are a relish and condiment; not much more.

Bad: When sour as lemon juice, though they look red and large.

Morphology: They have no tough texture and probably the Creator intended them as food from the seeds which project from their substances.

Disease: In addition to the above, if eaten unripe their carbohydrates are liable to ferment and produce cholera morbus symptoms and urticaria in some when the fruit is ripe. When tuberculous blood has been brought to normality by treatment they will quickly devolute said normality to abnormality.

Parasites: (1) borer, Tyloderma fragaria; (2) moth, Anassia lineatella, affect the roots; (3) strawberry spider crab, Eurynonome aspera; (4) strawberry moths, Angerone crocataria; (5) Acronycta oblinita; (6) strawberry saw fly, Emphytus maculatus; (7) wevil, Anthronomus signatus, punctures the blown stems to lay its eggs; (8) strawberry worm, the larvæ of four and five.

Where found in best condition: In Maine, town of Brewster, one Fourth of July morning years ago, the senior writer found an abundance of ripe delicious strawberries (wild natives); never before nor since has he found any better; cultivation increases size, but decreases quality.

ASPARAGUS

It is a case of unripe plant being edible when the mature is inedible. Has a fine flavor and is appetizing and greatly esteemed by many. Has been used for ages. The word is Persian. Judged by its good looks, taste and smell asparagus is approved. But here is where society makes a mistake. Eat solely of it and see how little strength it gives, how its active principle, asparagin $C_2 H_8 N_2 O_3$, is eliminated in the urine, and if you can live on it more than four days, you will do more than healthy men who tried it. Asparagus does not remove albuminuria, and should be avoided in diseases of fatty degeneration. But its large amount of nitrogen makes it a desirable relish if it is well borne and digested. It is also an easy plant on which to study the changes from rawness in cooking. We think hot water a much better and safer diuretic than asparagus. *Chemistry: See* page 124.

RHUBARB

Known to Greeks and Romans. Name comes from the river Rha or Volga. Is a relish as a sauce or in pies. We do not know how long one could live on it solely, but probably not long. The chemistry is interesting and not wholly settled; some claim a volatile oil, but this is not proved; crystals of oxalate of lime are found in abundance as well as an acid identical with chrysophanic acid. The stem is a very interesting study morphologically; sections are easily made; cooked, the anatomical elements are shown beautifully. It is not used alone to our knowledge and rarely raw, but in combination; its acid combines with sugar agreeably. Its softness and delicacy in the mouth and its acceptability to the palate and liver make it one of the most desirable relishes to the well and ailing, but not to the sick; those desiring pies will find rhubarb next to mince in value. Rhubarb is an excellent relish and pleasant stimulant to bowel peristalsis.

BANANA

A tropical fruit of prolific fecundity, easy cultivation and quick growth. Commerce of late years has brought this fruit to the United States in such abundance that it may be called a people's food. In this the banana is like wheat. Has about 68 per cent. starch and said to be the sole food in South Pacific Islands, and yet cannibalism is found among such bananivorous. The banana comes in admirably as joint food, as with wheat properly glucosed. Eaten generally raw; sometimes cooked. If we compare the bananivorous with the wheativorous we find the latter to excel. It is a question if the banana was as cheap in the United States as wheat, it could be substituted for the latter. We hear little of illness caused by it, but two Americans who visited the West Indies and lived largely on the same and oranges returned home sick, as evidenced by systemic symptoms and deranged blood morphology. On another like tour they took a large supply of Bovril and came home well. As a composite food for the well, in the United States, the banana is to be highly esteemed.

PINEAPPLE

A tropic food long and extensively used as a relish. We do not know of its ever being used exclusively. The banana has the preference in the tropics from abundance and cheapness. In temperate climes the pineapple is too expensive for sole feeding. It is a large spike of flowers clustered on a short stiff stem with bracts and sharp pointed leaves, almost like thorns. In use, the outside of the colony of flowers and fruit is cut off, leaving inside a soft, juicy mass among large fibrous cells. Odor peculiar, penetrating and pleasant. Sometimes eaten as such, but often they are kept in layers with sugar sprinkled between. The osmotic action results in the pouring forth of a very delicate and fragrant syrup that is a delight to the palate and refreshingly cool. Separated into a syrup, it is much in demand as a flavor to soda water from druggist's fountains. Pineapple has been said to have a power of digesting food, and therefore more than a simple relish. It is also a medicine claimed to dissolve the membranes in diphtheria. A lady informs us that she knows of a desperate case thus cured. We have had no experience to vouch for or oppose such statement.

SPIRITUAL AND MENTAL KINGDOM FOODS

Musics

Prelude: There are eight definitions of spiritual in the Standard Dictionary (1) As opposed to physical and metaphysical. (2) That highest principle of man's being which is distinguished from the animal soul. (3) The soul as acted on by the Holy Spirit. (4) Of or pertaining to sacred or religious things. (5) Of or pertaining to or directly proceeding from God, as spiritual man, spiritual songs, etc. (6) Marked or characterized by the highest and finest qualities of the human mind, as a spiritual face, etc. (7) Of or pertaining to Spiritualism. (8) Swedenborgianism.

Spiritual man: The Bible, an eminently spiritual book, mentions "food" fifty-four times; spirit, spiritual, spiritually, occurs five hundred and eighty times.

The spiritual man is the eternal man; the physical man is seen and is temporal. Take the modern magazine way of illustrating the histories of men; *i.e.,* photographs of the same man, from infancy to old age; they are exceedingly instructive as showing the changes of the physical environment of the spiritual man who sees, hears, thinks, tastes, smells, wills, minds, judges, understands, knows. The spiritual man endures, while the physical body is transformed, metabolized, dying and new born all the time.

What is man without his spirit! Go to some insane asylum and see the inmates in apparent physical health, but mindless, and so pronounced by the law.

The spiritual man when the physical man is dead is not a citizen, nor a husband, nor a father, nor owner of real estate; he is a spirit. Hence the close, intimate and vital relation of the spiritual, physical and psychical man. In terrestrial life, they are all inseparably connected, and when you come to final causes, as we can say that we have never seen electricity, but see and know what it does, so have we never seen man, only the temple he lives in and what he does.

The word "spirit" is from the Latin spiritum, breath—Greek, πνευμα. Air is invisible, but as we well know man would not live very long without it. For these and other reasons we justify the food division of spiritual kingdom.

Are musics food: We use the word musics after the Japanese, as we believe in the music of the ear, the eye, the touch, the taste, the smell, because music is harmonious motion of the air for the ear, and of light for the eye, and of vibrating motions of the nerves for the touch, the taste and the smell. Touch and taste music are still to be proved, save on the general principle that touch and taste are forms of motion, if not emotion. "Music, the science and art of the rhythmic combination of tones, vocal or instrumental, embracing melody and harmony for the experience of anything possibly by those means—but chiefly anything emotional, one of the fine art or arts of beauty and expression." Standard Dictionary. Music is Schopenhauer's "quintessence of life and events, without any likeness to any of them; also music embodies the general figures and dynamic element of occurrences," and is considered to carry our feelings with them.

If we had five meals a day, Schopenhauer's quintessence of life and events would be very realistic in our eating, while the dynamic occurrences of life would not be very dynamic if we had nothing to eat. The feelings of hunger are the earliest and the last in man to be realized; so as music comes to supply a spiritual hunger it is dietetic on such grounds, but we consider that its harmonious motions are the chief points. Music has long been considered an article of spiritual food. We quote these items from Cogan, 1585. "But for a mind wearied with study and for one that is melancholicke . . . as Aristotle witnesseth, there is nothing more comfortable or that more raiseth the spirits than musicke, according to that saying of Hessus, 'For nothing so exhilarates human minds with so great sweetness as the noble work of a melodious voice.' Aristotle declares that music is to be learned not only for solace and recreation, but also because it moveth men to virtue and good manners and prevaileth greatly to wisdom, quietness of mind and contemplation. But what kind of musicke every student should use, I refer that to their own inclinations. . . . The harp of all instruments is the most ancient and hath been in greatest prize and estimate. Orpheus with his harp delighted and fed the spirits or souls of Lions and Tigers and made them to follow him and with his sweet harmony drew stones and woods after him, that is to say, moved and qualified the gross hearts and rude minds of men. . . . Laborers, as the galley men, ploughmen, carters, carriers, ease the tediousness of labor and journey in singing and whistling, yea brute beasts are delighted with songs and noise, as mules with bells, and horses with trumpets and shawms are of fiercer stomach to their appointed ministry. So that melody is refreshment and food to the wearied mind and drive away melancholie." Themistocles when he was denied the lyre at a feast was unfitted for study. Spiritual songs are spiritual food; when sung with the *spirit* and the *understanding*, they feed the hungry souls of the worshipers better than the phonated words of the preacher and teacher. Music deserves a higher place in spiritual dietetics, in so much as the metaphysical soul and spirit excel the physical material body, wonderful though it is.

Are musics good: Yes, when properly used. Not many years ago a gentleman of one hundred years of age sung a bass solo, conducted an orchestra and accompanied on the piano a solo singer, at a concert given by his great-grand-daughter. And not many years have passed since there was a centenarian conducting a church choir in Maine!

The music of the eye is fully if not more good than that of the ear; this music harmony of the almost immeasurably minute vibrations of light is the foundation of the spiritual food we feed on whenever we gaze at majestic mountains, lovely landscapes, the foliage of flowers, grass and great varieties of vegetable life covering the earth in late spring or early summer, rainbows, gorgeous sunsets, polarized light, ladies dressed in colors that harmonize with themselves and their surroundings, and the colors of real paintings. Architecture brings forth "frozen music" in cathedrals and perfect public buildings. Indeed the milliners, dressmakers, jewellers, carriage makers, all vie in having eye music that is good. The music of the senses of taste, smell and touch go to form the delights of our lives when properly used not as an end, but as a means to the end of good living.

Bad: There is a good deal of bad music in the world. Some of it crazes and is the farthest from æsthetic, because it is unbalanced, out of tune, harsh, grating or wrongly played. Such music is very much like poorly selected, cooked and served food. The musical soul food in our churches is not always good. Complexity of church music is not in the question, but it is the rendering of simple music properly composed or cooked in conformity to the best of the resources at hand. Choirs are not drilled, as volunteers they will not come to rehearsals. The organ will be played, throttle valve pulled out, full and soft music will be rendered forte, or rather there will be no attention paid to the composer's marks of expression, and so it goes helter-skelter. Musicians are disgusted and stay away from church. Fortunate is it that the phonetic food furnished by the minister is generally better served, mainly because it is a monologue and easier to get at, but chiefly because church customs will not tolerate such errors in syntax and prosody as they do tolerate in music.

Eye music of dietetics is not so bad as it might be or as *the music of the taste and smell.* How many are there who have such a cup of coffee as is served at a few of the best hotels which has the bouquet, fragrance of the oil of coffee and a taste, that is music to the palate? And such is possible in private families. How many families boil potatoes properly, yet such cooking should be done always resulting in food that is music to the taste, digests easily and consequently nourishes better! Poor spiritual kingdom food is as bad as poor animal or vegetable kingdom food, and it all depends on care, other things being equal.

Condition of music feeders: Music food tastes best to the hungry, even when they are not aware of being hungry at all. In such cases it goes straight to the soul with quick and gentle power, and the memory of it will last for years. Church music heard in Vienna in 1862 is even yet a memory with the senior writer. Music food is suitable for all conditions of life, even the very sick, but it must be properly selected. It is to be hoped that music for the sick can be made more available than it now is. The sweetest vocal music comes from boys and children. It is the fashion now to have music at the dinner hours of the best hotels; it imparts appetite to those who need it, indeed all musics are in place and in good form at a first-class banquet.

Musics and anatomy: Burton's Anatomy of Melancholy is an adaptation of a spiritual matter to our subject. The word anatomy for ages has meant the dissection of the human body. Confined to this definition, the word is out of place in the spiritual kingdom, but the latest and best definition is, that it is a branch of morphology, that treats of the structure of organisms, human body especially. Morphology is a branch of biology or the science of organic forms. One definition of forms is the appearance or character in which a thing presents itself; likeness, image. In our vernacular, how often we speak of a divided mind, a concentrated will. If we come back to the original meaning of spirit as of things invisible like air, heat, electricity, we find that science has made divisions in them. Again it is certain, in our present state of existence, that we should not have any idea of spiritual kingdom food, but for our five senses and our mental and intellectual qualities, that bring spiritual things to our cognizance. Will governs all our life and is infinitely superior to any other attribute we possess. Anatomy comes in to describe the forms of organs through which we see, hear, feel, touch, taste, and that which is includeed under cerebration or functions of the brain, consciousness, intelligence, judgment, memory, love, hate, etc. Since sight, touch, taste, hearing, feeling, cerebration, emotion, are all forms of motion, it follows that for us to perceive them we must have the most wonderful organs of precision, that anatomy tells us of. This needs no enlarging.

Chemistry: There is much music in chemistry, that treats of the atoms of matter and their combinations. Atoms are infinitely small and in the most active motions within infinitely small spaces; so small as to be unappreciable to the senses, even in solid bodies like metals. These atoms combine in proportions that agree or symphonize, in incalculably minute motions, that form new bodies. The doctrine of election or selection is one of the great doctrines of chemistry. So it is in music. Chords that are mathematically agreeing with each other form harmony which is mainly a question of the vibrations of air, that numerically agree. Now where do we find vibrations of matter (save heat perhaps) equal to those that form the spiritual music of the eye (light) or olfactory nerves in perfumes that are capable of infinitely divisible atoms (as proved in the odor of musk lasting for many years without any sensible dimunition in the bulk of the musk). As we speak of the music of the spheres (meaning the sublime magnificent motions of stars, suns, moons and planets) may we not include in them the motions of atoms which are thought to be infinitely minute spheres? In studying for years the very minute microspores or seeds of cryptogamic vegetations such as have been found in the blood of scrofula, they are seen to be automobile and to go where they will, among the red blood corpuscles and the white serum interspaces, even when filled with fibrin filaments like a web of cotton cloth. They are much different from the minute globules of fat found in cow's milk, that move indeed, but with vibratory motions of tremulous to and fro movements; but the microspores change their places with apparent intelligence, which explains the cause of said motion to be inherent in said microspores. Look at a crystal of the triple phosphates of lime, magnesia and soda under polarized light; see its rendition of the music of light in all its perfection, exceeding that of a $7500 diamond, as once demonstrated under the microscope, and one realizes that the atomic motions of crystallization that produce such symmetrical gems must be due to a musical harmony of the chemical atoms. Ordinary music is not so good in a chemically impure atmosphere as in a pure one.

In the music of smell, the French chemists excel. But chemistry does not excel smell, for the refinements of organic matters go far beyond the chemist's skill and the most successful combinations of perfume music are the result of trying different combinations. Nitrous oxide gas in the air will often change the voice to a shrill tone. The usual odors of a chemist's laboratory are far from being spiritual music, but discord rather, stirring up the soul to disquiet. Some chemical compounds stop all the musics as the anæsthetics. Some help to restore the powers of appreciation, as ammonia inhaled during fainting. Chemistry and music have been yoked together at the annual celebration of the Sheffield Scientific School, in chemical songs of peculiar technical expressions which voice in music the ease with which different elements were married in atmospheric harmonies.

Physiology: Music of the ear serves to: dilate the capillaries and equalize circulations, quiet, strengthen and increase the power of the heart's beat, promote the excretion of carbonic acid gas, rest tired nerve centers by tranquillizing the sympathetic nervous system, quicken the memory, promote digestion, give courage and strength, open the spiritual faculties so that they will more readily understand the ideas promulgated by speech, calm in panics, persuade to better things, exalt into higher and more spiritual life, impart strength for conflicts with work and worry, help study, soothe anguish—mental and physical (a boy sang while his limb was being amputated and said he felt no pain), improve the general health, act as an athletic as at a musical festival, give expression to the highest, purest and holiest joys, enable to endure martyrdom, drown sorrows and griefs, and help the functions of the body to act in harmony and agreement of nerve forces, and thus feed the spiritual part of man so as to legitimately and truly enjoy life.

Multiple spiritual food: Generally so as in churches. It is associated with poetry the most beautiful, with ideas the greatest in the world, with history the most graphic, with visions the most seraphic, with doctrines the most far reaching, with spiritualistics the most omnipotent, with idylls the most attractive, etc.

Disease relations: Music may be good, but from environments be disease causing. In 1862, the Marseillaise hymn, a fine piece of musical form and ensemble, was not allowed to be sung in France for fear of exciting riot, revolution and bloodshed. When Napoleon invaded Egypt the bands gave public concerts, but when they played a tune, the melody of which we now call "We Won't Go Home Till Morning," the populace was frantic and a furious mob was aroused. The music ceased. Then it was found that during the French invasion of Egypt, seven hundred years previous, the same tune was played and it had rankled in Egyptian souls for seventy decades.

A poor quality of music is usually the cause of spiritually diseased effects. Of course it makes a difference in the standpoint of view or race. The Chinese music in California in 1871 was most horrid to the senior writer; to the Chinese it was physiological no doubt and no more outre than white being a mourning color. A song of recent years ran thus: "Johnny Morgan played the organ, His father beat the drum, His sister played the tambourine, And his brother went tum, tum, tum, tum, tum, tum, All alone on the great trombone, The music was so sweet, They gave them all another cent, To go to another street." The moral is that a hand organ, bass drum, tambourine, and bass trombone made a combination of disease causing music that resulted in its banishment, yet a financial success.

One thing noticed in Holland, in 1890, was that by statute all the street hand organs were kept in tune. There is no doubt that the public have a taste for diseased music. This is seen in churches where a hideous cornet leads the soprano part when there are plenty of soprano voices to carry it, and the cornet is useless save as a light played alto. Further, church music becomes disease producing when its splendid hymnology and music (much better than formerly) is spoilt by male voices taking the soprano part when the music is written for four parts and there are females and boys enough to carry said soprano. Solos, duets and trios are sung as choruses with the organ full blast. People sing out of tune, as the clergy tell everybody to participate, no matter whether in time, tune or on the wrong part, and the parts are not naturally balanced. A musical composition is put together with fixed rules as to time and arranged in four ranks of different character (bass, alto, tenor and air), to make a harmonious whole, else there will be confusion. The last thing there should be in public worship is confusion. It is disease causing, to spirituality. This catering to a depraved public musical taste has been seen markedly on steamboats, where the orchestra is made up of seven performers, *i.e.,* double bass viol, bass trombone, cornet, first and second violin, clarionet and viola; the double bass and trombone made two on the bass; cornet, violin and clarionet most of the time playing the melody, thus drowning out the second violin and viola. Thus was murdered what would otherwise be classical music.

The makers of *phonographs and gramophones* dispense disease music; for mere audibility, they cater the harshest, crudest, raucous music which cuts you like filing a saw, and then call for admiration and money for such abominable coarse, fog-horn performances. Banjo music, which is so popular, is merely the exaltation of the narrow and crude musical resources of slaves, poverty stricken in money and music, to the drawing room of the rich and learned, who ought to know better than to have pizzicato and no middle part music all the time, when it might do well enough for a change.

There is other disease causing music of the eye and ear: children's noises are more or less necessary; they are the natural expressions of their growing life, yet the mother, especially, becomes tired from the constant irritation of the nerve centers during the day; a helpful rule would be to insist that at certain hours, children must respect the rights of their parents and be quiet, even if only at the table. Table manners of young and old when uncouth disgust and irritate, this producing bad music to the eye and ear. The noise of cities, so much of which is necessary and so much of which is unnecessary, disturb the nerve centers and produce mischief. It is claimed that the noises which one has to bear in certain occupations and which one becomes accustomed to, do not injure the human body; this is wrong; such do injure, and there cannot be too much reform in the abatement of noises which are unnecessary, and an effort to find out whether the alleged necessary discomforts of the eye and ear might not some of them be remedied. It is well for both the young and the old to remember that silent moving, soft speaking people have a better chance for success in the world than their opposites.

Cures: Dr. Rush relates how a man was restored to sanity by passing by a church when a hymn was being sung which was a favorite of his mother's, long since dead. David's harp music curing Saul is another instance. Another one is that of a farmer more than one hundred years ago in Maine, who when crossed in love took a halter to hang himself in a log cabin; while on his way, a bird plainted her mournful tune for a lost mate; being a composer, he took down the notes and wrote the verse for a fugue tune. After this, he thought he would like to hear his choir sing it the next Sunday, and his suicide was indefinitely postponed. Typhoid fever has been greatly ameliorated by the use of a first-class music box. Music will relieve cramps, cure loss of memory, quiet heart palpitation, and put to sleep even in fatal diseases. Marsilius Ficinus says "I myself frequently try at home how much the sweetness of the lyre and song avail against the bitterness of black bile;" our word melancholy means the same. Dogiel of Kazan, Russia, experimented on the action of music on the heart, arteries, veins and capillaries, and showed with the sphygmograph that music increases circulation of the blood. It is a help in nervous prostration and in diseases of fatty degeneration that are caused by retarded and impeded circulation. It helps the lack of force, in diseases where there is a diminution of the excretions of carbonic acid gas and rests the muscles. Old age being a disease, Socrates used to play on musical instruments with the boys, thus using a good music cure.

Head and nerves: Mind, conscience, will, intellect, reason, judgment, are spiritual qualities that may be comprehended under one word, "cerebration," or the functions of the brain. Feelings, such as love, hate, passion, envy, joy, etc., belong to the nerve ganglions of the heart (a muscular organ), of which we have used the term "cardiation" for the automatic independent nerve functions. When the brain is tired out, over-active, or in a panic, because the voluntary nerves have stolen force from the sympathetic nerves, good music will so rest and refresh the sympathetic nerves that they are at peace with the voluntary head nerves, which then recover their lost tone and the head is made new again. If there are headaches from congested ganglions, music so strengthens the heart and dilates the capillaries, veins and arteries, that the blood, as well as nerve congestion, is relieved, and the confusion of stasis is over. This we think is especially the case when New York schools on fire have been safely emptied of two thousand children by having them march to music, which certainly was a spiritual food.

Memory is quickened by music. A child captured at about two and a half years of age by Indians, and kept thus for eighteen years, being brought in by the military who had corralled the capturing tribe, the parents recognized their daughter, but she did not recognize them until the mother sang the old familiar lullabies. We have already seen there are physical foods, or products of such foods, that cause metaphysical disease—as for example the gases from oat meal that caused acute headache, numbness, loss of memory and impairment of the cerebral faculties. Good music goes in to remedy these, by its direct action on the head nerve centers and indirectly in improving the digestion. Music in public worship prepares the head better to understand truths enunciated. Lecturers should precede and follow their discourse by good music. Ear and eye musics are sometimes well combined by hearing music and gazing on beautiful pictures of art or nature. Cogan, 1585, taught that students should practice or hear music as enabling them to do better head work.

Mountaineering is hard for the heart because of the rarified air pressure and the ascents; in this light, the story of Napoleon's soldiers pulling cannon over the Alps in his Italian campaign has added significance; the soldiers becoming exhausted, Napoleon ordered the bands to play, with the result of making history. Anciently, galley slaves were encouraged to sing, also carters, carriers, boatmen, negro slaves, over their hard work. The rhythm of the heart's movement in pulsation is very like that of musical compositions whose tempo is 4/4, seventy beats of the metronome, to the minute.

Eyes: Such music as furnished through the eyes, as previously noted, is ravishing and powerful.

Alimentary canal: Music promotes digestion and aids assimilation, confers force and strengthens the circulation of blood in the bowels and stomach.

Heat: Music increases the excretion of carbonic acid gas, showing greater combustion of air oxygen and thus warms. The holding of the breath in singing is a splendid way of warming the outer parts of the body, by throwing the blood to the peripheries.

Force: Music is a dynamic, as abundantly proved by the foregoing Dogiel experiments and the Napoleon incident.

Climate: Music is in all climes where man abides, and the music of light pervades the limitless spaces of creation with its most refined, subtle and incomprehensibly great number of vibrations.

Natural: Customs have not impoverished music food, save as allowing much poor, weak, lame and imperfect music to be served to the spirits of the public, and this is no more than customs have done to physical food. Per contra, an impressive sight and sound of London, 1889, was the singing of the blessing by the children of Guy's Hospital before they partook of their evening meal. Four brass instruments, one of which looked as large as the boy who blew it, accompanied the singers.

Aesthetic: Yes in the highest degree of sounds harmonious, which combine wonderfully with the æsthetics of the eye, palate, touch and taste.

Religion: Some kind of music is found connected with all kinds of religion, save the Friends Society with exceptions.

It is an art of great antiquity as a medium of religious worship. Vocal music was the oldest, and the Christian rule requires its use for edification. "The vocal music of the Imperial choristers at St. Petersburg incomparably surpasses in sweetness and effect that produced by the combined power of the most exquisite musical instruments." About 1800 B.C. vocal and instrument music was in use. Egypt was the place of the invention of musical instruments, synchronously with Palestine. The Psalms then used are standard words for sacred music to-day. These could be much more elaborated upon in antiphonies.

Builder of tissues: Indirectly.

The skin: Music causes the circulation of the blood to be strong in the outer parts of the body, hence the skin nutrition is better. The introduction of American methods of teaching music in the public schools in Japan has made a marked improvement in the countenances of the pupils of the forty thousand schools.

Fermentation: Music has a good effect on the sympathetic nerves, partly paralyzed by the gases of fermentation, as found in cramps and abdominal colic.

Parasites in music: Perhaps a better heading would be parasitic music, that is, impaired by a spiritual mould, as mouldy bread. The three prime requisites of music are rhythm, harmonious vibration and proper musical form. If any one or all of these are violated, you have parasitic music, and if this violation is persistently done at a public concert, look out for mouldy management. Such music is far from being a spiritual aliment; it is more like food adulterated and abased by parasites.

Intemperance: Music can cloy, over-excite and tire the spirit. Teachers in musical conservatories are glad to get off into a silent wilderness, and the last thing they wish to hear is music.

Note.—Endeavor has been made, throughout this work, to limit repetition; accordingly, attention is directed to the connection, as to subject matter of this chapter, specially with *Fermentation* and *Food in surgical affections.*

There is no such thing ever seen as absolutely pure vinic alcohol, conventionally so called, which is the ethylic alcohol or the hydrated oxide of ethyl, $C_2 H_5 (OH)$. Ether is the oxide of ethyl, $C_2 H_5 O$. There are a large number of alcohols, as methylic, or wood spirits, amylic, propylic, butylic, ænanthic, propenyl or glycerine, etc. This is enough to show what a large subject alcohol is. It would take a volume to treat fully of alcohol chemically.

Vinic alcohol here is meant that diluted liquid which is found in fermented sugars and starches, from which alcohol is obtained by distillation, *i.e.,* the intoxicating principle of beers, wines and liquors. It is one product of the action of saccharomycetes cerevisiæ or alcohol yeasts feeding on starches and sugars; known also as aqua vitæ or the water of life. Longfellow says "Paracelsus of old, wasted life in trying to discover its elixir (an imaginary cordial supposed to be capable of sustaining life indefinitely), which after all turned out to be alcohol, and instead of being made immortal upon earth, he died drunk on the floor of a tavern." As the yearly liquor bill of the United States is over one billion two hundred millions of dollars (and is the largest of the nation) ; as this vast sum is spent in drink; as most drinks are food; as some claim alcohol is food; as some disdain it as food and as some will drink it in place of real and true foods, we must give it place here as a *spirituous* food, and discuss it as we have done other foods. In order to distinctly understand our subject, let it be said here that it includes the following and more: *Absolute alcohol* pure, not used. *Dilute alcohol,* proof spirits, 54.5

per cent. water United States, 51 per cent water Great Britain. *Rectified spirit,* 91 per cent. pure United States, 90 per cent. pure Great Britain. *Ale,* a beer with a good deal of body, 6.20 to 8.88 per cent. of alcohol. *Beer,* Munich, 3.9 per cent.; Vienna, 4.1 per cent.; bock, 4.69 per cent.; lager (American), 3.85 per cent.; Holland, much less. *Brandy,* 48 to 56 per cent. alcohol. *Gin,* about the same as brandy. *Rum,* ditto. *Cider,* 5.21 to 9.87 per cent. of alcohol. *Wines,* 8.88 to 25.41 per cent. The longer kept, the less alcohol and better flavor (Christison). *Must,* already noted, is unfermented wine that only needs air and time to set the alcohol plants which are present in it a-growing. It is proposed to treat all these under one head, with the premise that the greater the per cent. of alcohol the greater the action.

Organic or inorganic: Organic, as conventional alcohol is produced by organisms of the cryptogamic vegetable kingdom. It is also produced by chemical synthesis, but only in technical laboratories and for curiosity. Its elements, carbon, hydrogen and oxygen, are found in stones and other inorganic substances, but this does not make alcohol inorganic, any more than man is, because he has indispensable mineral elements, nor any more than bone is inorganic, though it has mineral elements enough to keep its shape and size after all the organic elements are burned off.

Animal kingdom: No, even if the triatomic alcohol glycerine is also an animal product. Alcohol is produced in the alimentary canal, but comes from the fermentation of organic substances taken in from the outside.

Vegetable kingdom: Yes, as to repeat, it is produced by the action of the alcohol plant (saccharomyces cerevisiæ or torula cerevisiæ) upon starches and sugars. These plants and the alcohol produced are everywhere present in nature. (This cannot be repeated too often.) French chemists have tested for alcohol in doors and out with iodoform and have never failed to find it. So full is the air with it, that all organic substances as fruits and preparations, will, when unprotected, be covered with mould or the mycelial forms of yeast plants. Vinegar is made artificially by exposing dilute alcohol on beech shavings in diaphragmatic barrels to the action of the air. This shows that the alcohol is acted on by aerial vinegar yeast that is always found in connection with the alcoholic yeast. Yeast cakes will soon change into vinegar yeast if kept moist and dark. The relation of vinegar to alcohol is so close as to be almost inseparable. This has not been well explained, but we believe the vinegar plant is a descendant of the alcohol, and that the artificial production of vinegar, as above, is due as much to the vinegar plant in the air as to the alcohol in the water used.

The neck of a champagne bottle at the cellars of the California Sonoma vineyard was broken off squarely just below the cork by the pressure of the carbonic acid gas and alcohol; it was estimated by experts that pressure was equal to one hundred and twenty-five pounds to the square inch; this force was exerted primarily by the protoplasm of the alcohol yeast plant; why such protoplasm produces alcohol, glycerine and carbonic acid gas we cannot say, as under the microscope it appears like other protoplasms; this work in nature is a necessity in order to care for waste of organic products, as fruits, vegetables, etc., which are provided with such a lavish profusion, that they are not all utilized and if left unfermented would make the world a vast charnel house; the alcohol thus produced is taken up by the foliage direct, without going into carbonic acid gas, as it is volatile in vapor and ready to endosmose into the leaves in its very dilute condition, as the winds and tempests blow it everywhither. The alcohol and vinegar plants are in the order or family of those vegetations that mildew, mould, putrefy and decay, the corpses of animals; the poisonous ptomaines are all of cryptogamic origin. Were it not that the heat of baking destroys the alcohol plants, those who eat leavened bread would probably perish. The bacilli of tuberculosis occur along with the alcohol plant. The fact that alcohol is a product of vegetable decay is not in favor of its being a food. Putridity and rottenness are bad in foods.

Spiritual kingdom: No, save as given to those who are ready to perish. On the contrary the names, "aqua vitæ" (water of life), ardent spirits, etc., seem to connect alcohol with the spiritual kingdom. The immense national yearly bill for "alcohol" proves something more than a physical relationship to man. Love, mind, soul and will must be influenced to make so much alcohol consumed and plants for producing alcoholic drinks of so great capital. But the great provocative for the astounding use of liquors is the *will.*

Again the custom of treating to liquor indiscriminately is responsible for much drunkenness. Many a youth whose will is not to drink has been induced to change that will, and becoming drunken, he has been laughed at for making a fool of himself. The conquest of principle was really made over his spiritual kingdom of mind, intellect and will, before he was conquered in the physical kingdom and made the worse for liquor. Some argue that alcohol has helped their faculties and truly there are some alcoholic men of high rank. But to show that alcohol is not an intellectual necessity, we have only to mention Sir Isaac Newton, who drank nothing but water when he wrote his celebrated treatise on Optics, and John Locke, the mighty giant in intellect, who wrote the magnificent treatise On the Understanding, made water his common drink. Water drinkers have minds more clear and capable of greater efforts than those who use alcohol.

The time was when a physician was said to be "good only when half drunk," and that his perceptions, judgment, tact, etc., were better when his intellect was partially alcoholized. But this is past, and such physicians are put beyond the pale of their profession. So our great railroads dismiss engineers and employees who drink spirituous liquors on the ground of impairing their spiritual faculties of observation, judgment and action.

Another view as to the spirituality: many people depend on liquor as their spiritual refreshment, and saloons are fitted up with costly paintings and woods and stones, made up in architecture and furniture—as music to the eye. Yet these do not comply with the definition of food that we have used as a text, *i.e.*, "food is any substance or form of motion, biologically received from without that enters into the tissues and fluids of the human body to become part and parcel of it and normally sustain life." Of course, the music to the eye in the magnificent fittings of the saloons is in a way a mental food, but no more than that.

We do not confound spirituous with spiritual, but the evidence is unmistakable that alcohol does act powerfully in the domain of the spiritual kingdom, unduly exhilarating and exciting. If not, why should the word "intoxication," primarily meaning to poison, be specially applied to alcohol.

Good: As a matter of history, there are a great many who regard alcohol as a food, specially in the spirituous and spiritual kingdoms. Certainly, it is a good medicine in some cases. Its action in fermenting decayed matter is a good thing in the economy of nature, as a sort of aerial undertaker to remove dead and dying vegetable substances; also, when separated as rectified and dilute alcohol, it is good to preserve organic substances, animals even, from complete decay. But as noted, if very much diluted and exposed to the air it changes to vinegar, which in turn will go on to still further decay. Alcohol is a solvent for plant principles, and the tinctures made from it are useful and good in their place. It is also good to burn for heat and cooking. Those who esteem it good use it in culinary art; some think that mince pies are valueless without alcohol. Thieves, robbers and murderers find alcohol good to blunt their finer sensibilities and enable them to practice cruelties, stealings and tortures on their fellow-beings. Devils find alcohol good to help along their wiles and compass the destruction of men, women and children.

History shows a good use of the milder liquors. We are informed of a Jewish family that have used wine for several hundred years with never a drunkard. There are some that can take liquor and never be harmed. These are examples of temperance. Total abstinence is not temperance, but there are many who cannot play with liquors even lightly and not get hurt. All should have their choice unmolested. Some who believe alcohol is good can find an evidence in one individual who died at one hundred and one years and drank a glass of rum daily all his life. To offset this others have died at a like age who had drank no rum for seventy years.

Bad: Alcohol is a bad food, because it is a poison. Alcohol has a special appropriation of the word *intoxicate, i.e.,* to poison inwardly. It is a bad food chemically, as it is made up only of carbon, hydrogen and oxygen, and has not elements enough to supply the tissues their waste in transformation or metabolism, but mainly builds fat when it should build muscles and nerves. It is bad because it stimulates and exhilarates as a spur or whip. Horses are not fed on whips, when they need hay and oats to give them force, which when latent may be brought out if necessary by the whip. Alcohol may so confuse the sensibilities, that the drinker may feel he can do anything. It retards the circulation, especially the capillaries, making faces red because of the passive dilatation of the capillaries due to partial paralysis of the nerve centers.

English officers captured in India and fed very simply on rice and water, without alcohol, on their release found themselves high in rank because their superior officers were dead *from free living and the use of alcohol.* Alexander Selkirk, for four years on the island of Juan Fernandez, drank nothing but water. He had been there but a short time when he increased in strength amazingly, being three times as strong as he had ever been before. But sailing for England, he drank beer and other fermented liquors. After this his strength gradually declined, and in one month he was no stronger than any other man.

Alcohol is bad for digestion, because if strong it arrests the processes, and if weak it helps to add to the internal alcohol that is brewed whenever yeast fermentation attacks starches and sugars in the ingested foods. It helps the carbonic acid gases in their obstructive work, and if the alcohol turns into vinegar in the alimentary canal, its long-continued action causes consumption of the bowels, to name no more. Some reject this view of alcoholic fermentation in the alimentary canal; but we cannot conceive the yeast plants being found in the digestive tract in the midst of fermenting starch and sugar, with the accompanying carbonic acid gas, how alcohol cannot be present, without biology being reversed. If not there, the history of leavened bread making is denied, as alcohol has been collected from baking bread. It is a curious fact that people who are dyspeptic, and have never used liquors as a beverage, when put on food that does not ferment, miss the stimulus of the alcohol, produced by the intra-fermentation, occurring with their dyspepsia, feel as lost and weak as topers who have been deprived of their alcohol and bitterly complain.

Condition of feeders: This makes the greatest difference. For example, a man sick unto death with chronic erysipelas, was given *daily for three months* a pint and a half of whiskey, with no solid food; when cured he had no desire for liquor. Those who, in health, drink to raise their spirits acquire the taste or rather passion for it, which overcomes all considerations of prudence, wisdom and judgment. There are people who drink alcohol at their meals and have strength enough to control themselves from drunkenness. Such people may go on to the end of their days apparently in good condition; yet they have (some of them) insensibly shortened their lives by degenerating their tissues. Children should not drink alcohol, as it stunts their growth. Youths do not need it. Men and women are better without it.

Morphology: The illustrations of the saccharomycetes or alcohol plants show glassy, oval, oboval and globar bodies, composed of an investing membrane enclosing clear protoplasm, which, to repeat, when the plant is actively at work, make alcohol, carbonic acid gas, water and glycerine, etc., out of sugar and starch; said bodies have a vacuole or vacuoles inside, sometimes large enough for space in which with the one-seventy-fifth inch objective we have seen spores with such automobile force, that on one occasion one spore was chasing another spore about the concave periphery of the vacuole as children drive hoops following one another. The appearance in photograph is of a plaque plate with mammelonated surfaces like the protoplasm of white blood corpuscles. The one-seventy-fifth inch objective brought these out more distinctly than any other lens and hence is one of its superiorities, giving more detail of structure. When the space between the cover and slide is watery and thin, the yeast plants have been seen to revolve and show their forms to be exactly like eggs in solid geometry. They increase mostly by budding, and by cleavage less rarely. They have the power like algæ of ranging themselves in linear directions and growing into what is called mycelial filaments, which also increase by budding and by fruitage scattering microspores—the history of which we have not made out, but which we believe form the alcohol yeast plants when sown on fertile soils. Along with the alcohol plants are the vinegar. So close is the relation, that it is the business of distillers and brewers to arrest the development of the vinegar yeast, so as not to lose their alcohol. The mycoderma aceti or vinegar plant is made up of single microspores, much like that of the fruitage of the alcohol aerial mycelial filaments. These vinegar microspores are smaller than the red blood corpuscles, or about one-six thousandth inch; they usually gather in masses (plaques), seemingly glued together as by a soft cement. Besides these, alcohol plants are accompanied by bacteria, as seen in the photograph with the one-fiftieth inch objective taken in 1876. At first sight, vinegar plants seem out of place here, but botanists have noted that they and the bacteria always go with the alcohol plants. Bacilli are the babies of cryptogamic vegetations. The mother of vinegar is one of the forms of the full development of vinegar yeast, and is a curious collection of protoplasmic jelly-like substance, found abundantly in hydrant water, kept in wood, as set wash tubs, barrels or on board ship, and in cider set to form into vinegar (*See* Water, hydrant and ship); the morphology of mother of vinegar shows linear demarcations running parallel to each other, in their jelly substance, which is filled with the microspores of the mycoderma aceti, and once in a while numbers of alcohol plants are found planted as plums in a pudding. There is much to be learned about these processes. Every cook who makes leavened bread does what the distillers and brewers do, *i.e.,* produces alcohol, and if she does not look out, vinegar. Put your ear in the quiet night to a pan of dough rising with yeast and you hear the carbonic acid gas bubbles rising and breaking with multiple sounds like a hive of bees in active life. The alcohol can be made manifest by distilling. The vinegar will show (if care is not taken) by the sourness and sogginess of the bread. If the process is allowed to go on unchecked the dough will be unfit for use. The morphology of alcohol is associated with the decay of vegetable kingdom tissues.

Chemistry: The interest that chemists have taken in the yeast plants is far greater than that of the botanists. The many alcohols besides the one under consideration are differentiated by laws of combination so exact, elective and reliable, that chemistry has discovered said differentiations and given us a corresponding nomenclature. We know carbon as charcoal and diamond and hydrogen and oxygen as being united in water, and yet we find to go back to our former statement, that it is a protoplasm that converts these three elements into alcohol.

Physiology: Those who have part in the more than billion dollar annual liquor bill of the United States, by their actions show that to them alcohol is one of the greatest promoters of health; that it is good to warm a cold in winter and to cool the heat in summer; that no matter how well the functions of the body are going on, alcohol will make them better; that the feelings of hilarity, good cheer and conviviality that come from alcohol osmosing into the system, and specially into the blood, give a healthful stimulus and exhilaration to all the faculties; that those who drink to excess and become drunk are exceptions to the rule and are men of small calibre, unable to hold what they drink without intoxication, making no account of the varying susceptibilities of different individuals to alcohol and other poisons; that topers' red faces with their lividity and muddiness are physiological; that the pleasurable sensations experienced from alcohol prove that a jolly drunk once in a while causes one to forget cares and sorrows; that table liquors are the drinks to take at dinners, etc., etc. *Temperate people* regarding the physiology of alcohol state that it cannot be a true food when it is one of the products of decay and death; that sound fruits of the vegetable kingdom are wholesome for man, but when they are rotten with the decay from alcohol and vinegar yeast vegetations no one should touch them; that our vernacular language, to repeat, in applying the word intoxication to alcohol, makes it a poison; that it is a whip food of three elements peculiarly combined, and not enough to build up tissues, that have fifteen or more elements; that it has been found in plants, that oil in germination changes over to sugar, whence it is easy to change into alcohol in contact with the alcohol plants of decay and diastase (this is called mutual conversion, and it may be reversed and probably is; we have found that the sugar of the cells of a ripe apple has been converted over to amyloid by the pressure of the barrel head making a facet that looked as if rotten, but the touch revealed a hardness foreign to rot, and the microscope revealed the starch or amyloid that turned blue with iodine; this gives reason to say, that alcohol may be converted over into fat and long used may become a producer of fatty degeneration); that alcohol is a paralyzer of the vaso-motor nerves, and pushed makes acute locomotor ataxia, reeling, want of co-ordination of nerve centers, thickness of speech, tumbling anywhere into dirt and filth, in other words paralyzes the motor nerves; that it also paralyzes the sensory nerves, making a special anæsthetic, causing vomiting; that when further pushed, alcohol makes one dead drunk (*i.e.*, complete anæsthesia, as if etherized), incapability of feeling motion or exercise of brain functions. Temperate people admit that abuse makes good foods bad, but there is none in the list that steals away the senses so deeply and deftly as alcohol. Slight injuries may result fatally in the intemperate; that is, alcohol impairs the constitution and goes against longevity. The more articles the stomach has to digest, the worse it is for the digestion, especially when loaded with alcoholic drinks and food that will ferment.

Disease relations of alcohol: The action of alcohol long continued is to produce a chronic congestion of the gastric walls, so that after death they appear as red as beefsteak, when the color should be white, like that of tripe, because of the paralysis of the vaso-motor nerves of the capillaries of the stomachic circulation. Those who drink, sometimes act as if they did not want to move for want of nerve force to control properly the muscular action. The one who gets easily angry or mad at nothing, as we say, shows a lack of nerve force, or call it unsoundness of mind. Drunkenness is acute insanity causing perversions of action that characterize maniacs and lunatics. Fifty per cent. alcohol has the power to dissect out the ganglionic multipolar nerve centers of the gray peripheral matter of the brain. Some years ago Dr. Harriman, of Boston, and the senior writer experimented with calves' brain soaked in alcohol; beautiful morphological results followed. May it not be possible that alcohol drank as some people drink it, thus pathologically changes the living nerve centers. (*See* Alcohol and the head.)

Alcohol helps to produce fatty degeneration (a replacing of other tissues or parts of tissues with some form of the many fat acids). Even the solid fats may degenerate into oils or oleic acid. Carbon, hydrogen and oxygen are the elements from which alcohol and fats are made. We have seen that fats in the plant are converted during germination into sugar and the sugar into fat by diastase. It seems then there is nothing to hinder alcohol being turned into fat and replacing other tissues. There are three special causes of fatty degeneration: (1) retarded or impeded blood flow and osmosis; (2) fats in excess; (3) carbohydrates in fermentation. Starting with the alcohol made outside, as in drinkers, it is helped by the fermentation in the alimentary canal of foods, so that heavy drinkers have a double chance for the degeneration, aided by the vaso-motor nerve paralysis. But the greatest cause is the want of elements to make tissues that themselves have more than simply carbon, hydrogen and oxygen. Then there are such things as making the epithelial cells of the lining membrane of the alimentary canal drunk, and thus not properly selecting material to organize into tissues, just as a drunken man would eat improper food.

Alcohol also produces fibroid degeneration. The fascias and white connective fibrous tissues are all glue tissues and ferment into soluble forms of carbohydrates like sugar and starch, and the kinship of alcohol to carbohydrates makes it easy to have it turn into fibroid tissues in excess, thus forming fibroid tumors; besides, the vaso-motor paralysis retards and impedes the circulation connected with assimilation, and thus the fibrous tissues may increase beyond bounds, and not only be too much developed but degenerate; for we find fibroids varying in density from great hardness to that of water almost. The paralysis of the vaso-motor system of the capillaries caused by alcohol helps along the formation of degraded or devoluted fibrous tissue. We do not insist that this will occur in all cases of alcoholism, because in some there will be a splendid constitution to ward off such troubles for years.

The enlarged toper's nose is an example of fatty and fibroid degeneration. It is not said that all fibroids are caused by alcohol, but that some are. It is an interesting question how far latent alcoholism is causal of fibroids; *i.e.,* that alcohol brewed in the alimentary canal of dyspeptics bloated with carbonic acid gas. Cases of fibroid disease have been cured by feeding foods in which there is no alcoholic fermentation. Women living on pies, cakes, white bread, ice cream, candy, confectionery, etc., all go into the business of alcohol making from the sour mash fermentations. This has been further proved: wheat flour has been raised into bread by yeasts from the bowel discharges. Take the muscles of porters alcoholic from habitual beer drinking: in 1889, at New York, a small temperate expressman took a Saratoga trunk on his shoulder, did no harm to surroundings, and walked off with it as a light load. At Kenilworth, England, the same season, three porters could hardly carry the same trunk upstairs, and jabbed the corners into the plastered walls! this trio had very red faces and rotund bodies; they breathed hard; the New Yorker breathed easily. The condition of the English trio was due to the very flabby fragile muscles; palpably alcohol is not a proper food for muscular tissues, but for fat. Fat weakens by coming in between the muscular fibrillæ, and also by taking their place. Athletes do not train on alcohol to make their tissues tough like a good textile fabric that stands wear and tear, while a rotten fabric gives out in light service. The normal fat acids, as palmitic, stearic and margaric, are solid like a candle. Oil or oleic acid is not regarded as normal under the skin; when oil is found on the slide in human blood (said oil does not come from the blood, as after a full meal sometimes, but from the fat beneath the skin) it is regarded as the first sign of fatty degeneration; when such has been removed, so that the oleic acid becomes palmitic, or margaric, or stearic, feeding on starches and sugar (alcohol food) will bring on a devolution to oleic acid again. In general terms, alcohol continuously employed is disease causing, because it stimulates and exhilarates with only three basic elements, and cannot commonly sustain normal life. Over-stimulation and over-exhilaration exhaust the vital forces, and hence the constitution is undermined and breaks down in the ordinary demands made upon it for the performance of the functions of life.

Action of alcohol on human blood: Dr. Harriman, of Boston, took a tough drunkard and paid him to drink as much whiskey as he could continuously. He drank two and one-half pints at one sitting. Blood specimens were taken, dried on slides, and then photographed with one-sixteenth, one-fiftieth and one-seventy-fifth inch objectives (with sunlight, no heat protecting cell, wet plates, exactly as the micro-photographs of consumptive and comparative physiological specimens of blood were taken in the former series by the doctor and the senior writer). The action of the alcohol was to shrivel the red and white blood corpuscles in various ways. One of the most impressive features brought out, was the production of amœboid character, thereby making the red corpuscles imitate closely the white, or in other words reversing the ordinary biological characters of the said corpuscles and unfitting the red corpuscles for their normal work in the system. Indeed it is rare that the white corpuscles put forth such an arm as one red blood corpuscle showed. It is more like the action of a fresh-water amœba with which most microscopists are familiar. Some of the corpuscles were bleached and as it were deprived of one-half of their body space, showing a great contraction of the protoplasm contents and yet without a darker condensation of structure; a like condition as to the red blood corpuscles was found by the junior writer in

1888 in the blood of a costly cow dying of milk fever. Cases of alcohol poisoning are energetically treated in our hospitals, with some at that dying; in private practice, we have seen young men in collapse, pulse forty, cold perspiration from head to feet, who needed active attention and of the most positive medical nature; such cases have always occurred when the opportunity for blood inspection did not present; let us have more study on this line. The impression given a physician treating such cases is that man is hard to kill. Further action of alcohol and vinegar on the blood is noted in the experiments of killing twenty-five per cent. of hogs in eight weeks fed on sour whiskey mash; all of one hundred and four cases autopsied had embolism and thrombosis, that is the fibrin of the blood was before death coagulated in filaments, skeins and masses of aggregations, swimming as clots or stuck like plugs in the vessels, the heart included. Evidence is very clear from the management of cases of disease of the action of the alcohol and vinegar in producing these fibrin clots in the blood. It should also be remembered that this thrombosis is liable to occur in alcohol intestinal brewing people as in dram drinkers.

Alcohol and tuberculosis: In 1858-59 the senior writer travelled five thousand miles in the United States in five successive months, partly to find out the connection of alcoholism and tuberculosis. He talked with many physicians and inspected the records of deaths in many cities and cemeteries, but was unable to find any bond between them. Ten years later he came across the fact that experiments had been made as to the brother or cousin of alcohol, to wit: vinegar, and said experiments were so many and decisive that he considered he had found the missing link in tubercle production, and his mind having been so trained by work in the line of carbohydrate bodies, it was very easy to accept the findings of these experiments: ten hundred and twenty-six swine were fed on distillery mash and about twenty-five per cent. of them were dead in eight weeks. One hundred and four of these were autopsied and tuberculosis found. The physical appearance of the blood in tuberculosis obtained in said hogs and also in man ever since. The mycoderma aceti or vinegar plant appears in the blood of such cases. There would be no sour vinegar mash unless there had been alcohol mash before. So far as this goes, alcohol is causal of tuberculosis. As dough is raised with leaven, and too much yeast or too long exposure will cause said dough to sour into vinegar, it is easy for vinegar to be formed in the intestines from alcohol, especially when no pains are taken to arrest it. Tuberculosis is started by vinegar yeast in the intestines. If the epithelia of the mucous membrane are constitutionally strong they will not allow the invasion of the blood by the vinegar yeast, and thus we have tuberculosis intestinalis, or consumption of the bowels. But if the villi epithelia are not able to prevent the invasion of the blood by the mycoderma aceti, then tuberculosis may occur in any part of the body, but specially in the lungs. Generally in fermenting liquors with air bubbles, you will find the automobile spores of the vegetations swaying about said air bubbles. When the lung capillaries are not dilated by full inspirations they are contracted and hold said mycoderma aceti, when it will grow and interfere with the nutrition and produce the retrograde changes we call tuberculosis. The bacilli, being always present, are babies of said parasitic vinegar yeast.

Note.—This Primer on Food has no space for polemics; we wish only to add, in this connection, that certain American medical contributions in the seventies and eighties were on the necessity of systemic treatment of tuberculosis (perhaps notably the senior writer's publication in the transactions of the American Medical Association of 1880 of the histories of seventy cases of tuberculosis, one-third of which were termed permanent arrests of the disease), great emphasis being made on the use of the morphologies of blood, sputum and feces in diagnosis and management; the promulgation of Koch's discovery of animalized bacilli as causes of tuberculosis fixed the medical world on one point of attack only, to wit: the killing of the bacilli by germicides; how useless this has been we need not to go into; it is a matter of congratulation that the pioneer American work of over thirty years ago has borne great fruit; the treatment to-day is systemic and men no longer cavil when it is claimed that we are able to combat this disease; the awakening interest in blood work means the eventual use by all physicians of the morphology of the blood in pre-tuberculosis, when it is easy to change the course of the patient back to permanent health, as this diagnosis is made ere there are broken-down lungs throwing off animalized bacilli (tubercular) of the mycoderma aceti.

The mass of civilized mankind eats in excess starches and sugars that are alcohol and vinegar producers in decay and death, and it is no wonder that tuberculosis is called the "white plague." The death rate on a low estimate is twenty-five per cent. of all cases of disease. One great factor in tuberculosis of cattle is the alcohol and vinegary fermentation, especially in silo and stall feeding. A study of grass-fed cattle in Oxford County, Maine, showed the absence of the pre-tubercular state, as evidenced by there being no mycoderma aceti present in the blood, and also by the health of said cattle. Silos heat, burn, smell like sour molasses and show the presence of alcoholic and vinegar yeast. Also, silo fed cattle are kept in stalls and not allowed healthy exercise, thus making them doubly liable to tuberculosis. Alcohol and tuberculosis both with vinegar are products of decaying organic matter, and are half-way houses to death of vegetables and animals. Alcohol and vinegar prevent the cure of tuberculosis. Alcohol exhilarates and stimulates dying tuberculosis cases, hastening death, because there is little force of resistance left in the decaying system. Alcohol may rouse the imagination and excite the feelings and joys of the consumptive, but it is like the flickering blaze of an almost extinguished wick. *Rock candy and whiskey* are poor things to give consumptives. They may taste good, feel good and be relished, but they are only carbon, hydrogen and oxygen, both of them, and the better the alleged effects, the sooner are the forces of life used up. They both go to help the vinegary fermentations grow more luxuriantly. If any consumptives resist them, it shows a wonderful constitution.

How long can alcohol be lived on as single food: The longest we have known was the case of a young man, son of a dead liquor dealer, who his mother said lived on beer and alcohol for a year and a half. It is probable he lived most of the time on beer, eating a few other things and drinking some milk, so this history does not wholly answer the question, but to us it is a marvellous example of the resisting power of nature when so poorly fed; the man died of typhoid conditions, flabby tissues, vacant and weak mind. Another case was a man with typhoid fever who lived fourteen or fifteen days on wine and when he convalesced found it distasteful to him. The use for several months, by a case of erysipelas, of whiskey has been noted. In 1815 the French frigate Medusa was wrecked on the coast of Africa. Of the survivors on a raft, those who lived on liquor fared worse and died sooner than those who starved without liquor.

Multiple food: Usually. It is taken in connection with foods of common reputation for good. Even in saloons, when drinks are taken the lunch counter is generally patronized. Sprees are times of special feeding on alcohol, lasting generally for a week to forty-two days, and as one spreer said, "such have to drink until nature rebels."

Cures: Alcohol has a reputation of curing most diseases, especially with lay prescribers for their own ailments. Policemen have been brought to bay for drunkenness and plead that they took alcohol as medicine for malaria. So of people who take cold or fear they are going to take cold, their apprehensions are quickened according as they love liquor. Many take it as a medicine for grief; as a double-edged sword to sever sorrows and double joys, and to fight a cold or cool a fever. It is used as an antidote in snake bits; and curiously in delirium tremens, peculiarly an alcoholism, the poor victims often see visions of serpents and other horrors of a crazed imagination. The impression in the medical profession is strongly gaining favor that alcohol is not a good medicine, on the ground that it is work to live in health and more work to live in disease; a patient needs generally more food than a well person, and said food must be concentrated and known by experience to sustain life, and therefore must have elements enough to renew all tissues biologically.

Head food: No, because it has only three elements. It makes fatty degeneration, which is specially bad on the brain, causing a softening and apoplexy, and it has no lecithin or other brain food. It confuses, warps, irritates, partially paralyzes, sometimes steals the brains and destroys the cerebellar functions of co-ordination of muscular action, producing acute locomotor ataxia, acute paresis, and acute insanity. It makes one cruel to himself and those he loves; annihilates the judgment, so that there occur all sorts of excesses (even murders), and all sorts of unethical deeds, even wallowing in the mire like a hog. Sterne, *Journal of the American Medical Association,* March 23, 1901, states that the changes in the ganglionic nerve cells of the cerebellum by acute alcoholism have been demonstrated. There was a diminution of the chromophile granules of the nerve cells of the outer part of the brain and the large multipolar cells of the spinal gray matter. The importance of these changes is vastly increased in the light of the theory that the ganglionic cells have amœboid movements, producing contiguity of structure without continuity. Sterne concludes his paper: "It is not the man who occasionally becomes intoxicated who gets into trouble, but the man who drinks much and never gets drunk, or he who is nearly always drunk that becomes a candidate for disease . . . his are the nerve tissues that show slight vitality, his offspring of stunted intellectual mould show signs of mental degeneracy, making them easy victims of epilepsy, imbecility, and idiocy, and a right to a berth in the insane hospitals, etc." (*See* Alcohol and Disease.)

Heart and muscles: Muscles have carbon, hydrogen, oxygen, nitrogen, and ash percentages, as follows: Chloride of potassium 14.8, phosphoric acid 36.6, sulphuric acid 2.9, potash 40.2, earths 5.6. Against this put alcohol with its carbon, hydrogen, and oxygen, and thus it lacks six important elements as muscle food. No wonder muscles turn into fat when alcohol is used.

Alcohol under competent medical advice is a good medicine sometimes for diseases of the heart. Since placing such cases in proper position and in ten minutes' time the pulse has been reduced from one hundred and sixty to eighty beats per minute, position is thus far preferable to the use of alcohol acting as a spur or whip to the heart and muscles, as this very whip exhausts the vitality, and if food is not used the retrograde reaction will very likely kill the patient when the alcohol stimulant is gone. Again this stimulant of alcohol to the heart will create a feeling of more strength and confidence than the vital forces can sustain, and there may be a sudden collapse and breaking down.

We should not be doing full justice to our subject if we do not touch on the effects of spirituous liquors on the heart spiritually. Instances have been known where it was the duty of some to take human life legally, and to refuse to do it for "want of heart." It is related of a celebrated Italian singer in the fourteenth century, captured by robbers who intended to kill him; he sang so well that they let him go. Here music transformed cruel murderous hearts into those of compassion. But alcohol acts the reverse of music on the heart; had those murderers taken alcohol, we think that the said singer would have been killed, because alcohol stifles all feeling of compassion, pity or respect for the rights of others.

Mucous membranes: Strike a man on the back of the neck and if he is not killed by the blow, he is liable to choke to death from the pouring out of tough, tenacious, gluey, protoplasmic colloid from and by the mucous membranes partly paralyzed from the effect of the blow; the same condition is found in the bladder (urinary) in diseases affecting the lower part of the spinal axis to the degree of paralysis; also in mucous membranes of lungs, throat and enteron due to fermenting paralyzing food in chronic disease; but this condition is also seen acutely in alcoholism; it is called spitting cotton; men recovering from a debauch may be seen literally pulling out of their mouths the stringy, gluey, protoplasmic colloid.

Eyes: The eyes of drunkards betray them often. They are red with passive congestion of the whites. or may have a muddy look, corresponding well to a muddled brain. The eyelids are often thickened, sodden, reddish. The eyes, taken as a whole, come next to bony structure, especially in the corneas and crystalline lenses, and is is easy to see how alcohol cannot be a good food for the eyes, because of its three sole elements. The eye is nourished more by osmosis than by any other function of nutrition. There are but few blood vessels in the cornea—the crystalline lenses, the aqueous humor, the sclerotic coat. The specific gravity of alcohol is much less than that of the blood, so there must be osmotic trouble, which explains the retardation of circulations in drunkards' eyes and lids, and perhaps the wonderful mental aberration in cases of delirium tremens. The eyes are commonly considered an expression of the condition of the soul. Compare the blear, smirking, leering, ogling, sinister, wild, glaring, fiery, or blunt eyes of the drunkard with those of a sober man—clear, bright, expressive, calm, mild, gracious, clean, wholesome.

Again one test of ether or alcohol anæsthesia is the sensitiveness of the eye to the touch. The patient may appear to be anæsthetized by the loss of power shown when the arm is lifted up falling limp and helpless, and yet if the eyes respond to the touch the anæsthesia is incomplete. Anæsthesia of the eyes shown by irresponsive touch and non-contracting iris to light are good signs of death. Again the eyes are instruments of precision of the sublimest and minutest accuracy. Alcohol, a decaying product, destroys their accuracy and makes them report to the "ego" of the soul (the spirit of man), the terribly wrong evidence noted in the cases of delirium tremens.

Bone, hair, teeth, nails: Alcohol is bad for them, because it has only three elements—carbon, hydrogen and oxygen. Bone has cartilage and blood vessels, 33.26 per cent., phosphate of lime 52.26, fluoride of lime 1, carbonate of lime

10.21, phosphate of magnesia 1.05, oxide of soda .92, chloride of sodium 0.25. Oxides magnesia and iron 1.5, teeth food (Marchand).

Teeth	*Dentine*	*Enamel*
Phosphate of lime.........	66.72	89.82 and traces of fluoride of lime.
Carbonate of lime.........	3.36	4.37
Phosphates of magnesia....	1.08	1.34
Other salts.....	0.83	0.88
Chondrin.....	27.61	3.39
Fat.........	0.40	0.20

Von Biha.

Nails are a horny development, agreeing very closely with the epidermis; they have a greater proportion of sulphur and lime than other tissues; they have more phosphate of lime than the epidermis. It is evident that horny nails are more like bone than alcohol, with its carbon, hydrogen and oxygen. Protein, a substance of the nails, is composed of carbon, hydrogen, oxygen, nitrogen and sulphur. Sulphamide is composed of nitrogen, hydrogen, sulphur and oxygen.

Hair: Chemical composition is not well understood, but it is chiefly a nitrogenous substance. It is considered a protein compound with sulphamide, oxide of iron, oxide manganese, silica, phosphate of magnesia, sulphate of alumina and lime. To recapitulate, alcohol is not a good food for hair, nails, bone, teeth.

Alcohol and the intestines: The action of alcohol here should include the action of vinegar, which in such organs must be found whenever alcohol is taken into the alimentary canal, unless osmosed away into the blood. The subject is divided into two parts: (1) *action of alcohol* drank as liquor; (2) *action of alcohol and vinegar formed or brewed in the alimentary canal* from starches and sugars eaten as food; as to importance this division outranks the first; more people suffer from alcohol and vinegar brewed within them, than from intemperate alcoholism; it is needed that the latent influences of alcoholism should be laid bare, and hence we will consider this first. Ordinarily, there is not enough alcohol to intoxicate but enough to be missed when withdrawn, and it is this dilute alcohol that will change into vinegar faster than in the leavened dough or the whiskey mash, because the warm nooks, folds, crannies and turns in the intestines give place for the alcohol and vinegar yeast to nest in. This is specially so when digestion has been delayed by want of normal downward movement of the bowels. There are other alcohols (some twenty-four) which have a different yeast and vinegar. Some of these are found in the intestines, and sulphuretted and phosphoretted hydrogen are evolved from them. After long existence and persistence they likewise paralyze the intestines, so that fibrous tissues are laid down in excess, even like a string tied so as to stricture the intestines. We have spoken of the epithelia of the intestines being made drunk by alcohol and transmitting the vinegar yeast into the blood and producing disease of the lungs. As before noted, when the trouble does not go so far, one can see cases of consumption of the bowels manifested by chronic diarrhœa. *See* Alcohol and Tuberculosis.

Action of alcohol on the intestines when drank: This is exosmosed out of the alimentary canal almost immediately, as shown by its flying to the head. It does not remain to form vinegar, but is eliminated by the skin, kidneys, bowels. The harm in this respect is not like that when alcohol is brewed in the bowels. When drank to excess, there may be a chance to become vinegar and thus produce chronic diarrhœa, but we think it is not often that this is the case. Its force is felt more on the liver, as being directly absorbed into the portal circulation; and also on the kidneys, that do their best to eliminate any liquid poison. But whatever part in the alimentary tract alcohol does touch, it tends to paralyze those parts, passively dilate the capillaries, and thus render them liable to fatty and fibroid degeneration. That this local action is severe is shown in the deaths of young people who have drank spirits. The process is called burning, but this is more in the feelings, because the reddened stomach and intestines are so from passive more than active congestion.

Heat: The heat units of alcohol, as a food, are omitted principally because the chemists do not agree that alcohol is food. But a chemist connected with the Government has made some experiments by feeding a man in a closed cage or chamber on alcohol, and finds that alcohol does furnish heat. This announcement has probably attracted more attention than all the utterances of our Government on this subject, although the experiment of but one man on one man. Considering this experiment to be final, alcohol must have more qualifications than that of heat alone to be called a food. On this ground we might call the live wire of the trolley car, food; or coal, wood, shavings, coke, petroleum, grass, hay, or any organic substances as ether, naphtha, benzine, that burn, food.

Force: Opinions on this are divided. Some take the ground that alcohol confers force. Formerly our naval authorities used to issue a spirit ration with this idea, but it is not so now. Few athletes strive in prize battles or liquor as a force. Alcohol is a whip as proved, but we have seen enough to show that whips confer no force where there is none. True foods do confer such. The exhilarating and stimulating effects of alcohol have been mistaken for force, because the feelings were made incapable of realizing the situation. As a spiritual force how poor a showing do the alcoholists make as compared with the non-alcoholists.

Climate: Alcoholists find no place where alcohol is unsuited to the climate. But it is found that Arctic and Antarctic explorers get along much better alcoholless. So on the sea and so in the army on the march.

Natural: Alcohol is the natural product of decay, caused by action of a yeast on organic matters. It is not naturally found in quantities, but has to be separated from dying grains by distillation, an artificial process. Water in vapor is condensed by cold in the air and is a magnificently sublime operation of nature. Alcohol is evaporated into the air, but never condensed by cold into rain. Compared with water, wheat and meat, alcohol is not a natural food at all.

Customs and ethics: Civilized and uncivilized people from time immemorial have drank alcohol as food; if not for the body, for the spirits in the estimation of the drinkers. On the other hand, the people who do not believe this, but regard alcohol as a poison, are very many, and if they would all unite together, would probably do away with much of the evils of alcoholism. But such is the hold of alcohol on the people who use it, that there is a constant warfare between the factions, and until more enlightenment comes this will continue. In the vinelands, whole people live from the products of the vine or from the beer business.

Aesthetic and fashionable: If there were in alcohol no money nor æsthetics (love of the beautiful by the perverted judgment of the alcoholist) there would be but little of the present use of alcohol. There is an æsthetic enjoyment (low in quality, to be sure) to the drinkers of alcohol from its exhilarating and stimulating effect. This enjoyment may become so strong a love that it will supersede all else. No fashionable banquet is considered in good form and complete alcoholless, though great changes have been wrought in the last few years as to this custom, and people may now attend such banquets and abstain without the annoyance which used to follow such abstinence. The fashion of treating, so common in America, is wholly wrong, leading to extravagant expenditures and acute drunkenness. The fashion as to alcohol on board the Atlantic Ocean passenger steamers is a disgrace to the twentieth century. It is a fashion to make champagne much adulterated, using cider, and thus a profit of five hundred to one thousand per cent. This is, of course, in keeping with the fashion of adulterating true foods. Other lines of fashion might be noted.

Alcohol and religion: The Bible has much to say as to the injurious effects of alcohol, but it is impossible to quote here even a part of its dicta. The Mohammedan does not use alcohol.

Builders of tissue: Alcohol cannot build any tissues that depend for normality on sulphur, nitrogen, phosphorus, potassium, sodium and chlorides. The tissues that alcohol can build are fat and glue.

Effect on the skin: People generally judge of health, disease, mind or character by the skin of the face. If a man is drunken, or is a heavy drinker, it usually appears in redness of the facial blood vessels. There may also be seen somewhat enlarged blood vessels, with their numerous ramifications, like rivers on a map; there are muddiness, lardaceousness and lividness. But perhaps the most prominent advertisement is the toper's nose. Sometimes it may be found in a moderate or total abstainer, but even then it is a question whether it is not due to the alcohol brewery in the alimentary canal of fermenting starches and sugars: the toper's nose may be expected from alcoholism for the following reasons: (1) because of vasomotor nerve paralysis where the blood vessels terminate in the V of the nose, making the circulation to double back on itself and thus easy to impede and retard; (2) because alcohol is easy to convert into fat; (3) because alcohol alone cannot build up normal skin tissue; (4) because a fat-producing food, overfed, will degenerate the normal fat acids, palmitine, stearine, and margarine into oleic acid; (5) because the fibrous tissues of the skin may be fattily degenerated by alcohol. Again the blear, sodden, heavy eyelids of topers make another showing of alcoholic character readable at sight. Taking the view that skin diseases, save from contagions, wounds and injuries, have been classed as simply forms of passive inflammation or congestion, it is seen that alcohol, a paralyzer of the vasomotor nerves of the skin, is not a proper remedy in skin treatment, where causes are to be removed and nature fully assisted. There is no need of the heat of alcohol in the skin which has heat enough already because of the abnormally dilated capillaries.

Fermentation: We have seen in the foregoing, that alcohol is a product of decay, fermentation and retrograde changes in nature to deliver the world from the effects of accumulating dead matter, and that its results in man are also in the line to remove said man from the active normal life.

Parasites: The mycoderma aceti, or vinegar yeast, which is always found in connection with and lives on alcohol, may be deemed a parasite of it and very destructive to the human race in tuberculosis.

Intemperance: What is it? Especially, habitual and excessive indulgence in the use of alcoholic drinks. Inebriety is habitual intoxication. Intoxication is to make drunk, as with spirituous liquors; figuratively, to elate or excite to a degree of frenzy, as "his success has intoxicated him." *Ebriety* is drunkenness by alcohol. (Standard Dictionary.) We have intemperance of eating foods, of speech, of action, of passion, of miserliness, of money making, of religious enthusiasm or otherwise, but no intemperance is so much present in man as that of alcoholism; nor so costly in money, character, influence, and power as ebriety, and none monopolizes or takes the first place in the definitions of dictionary makers as alcoholism. Those who call alcohol a food will have to admit that it is the most poisonous of all foods in its action on the head, liver, kidneys, muscles, nerves, else it would not be classed as a toxin (poison) in the very name intoxication. The nerves of sense may repel it, but the nerves of conscience, will, judgment, are so deprived of their normal functions that alcoholic intemperance wrecks both body and soul. Prohibitory laws will not cure the evil, which will end only when men will live normally.

FERMENTATION

Biologically, when food does not digest, it generally ferments with the common yeast and vinegar, and this may happen when the food is good and the eater overdone by work, worry or pleasure. This has been often referred to herein; especially in the chapter on Alcohol, as well as those on Food in Chronic Disease, Acute Disease and in Surgical Affections; it is well, however, to briefly recapitulate:

The effect on the stomach and intestines is dilatation from the partially paralyzing gases; the alcohol has also to do with this; sometimes the distension is enormous; this is bad, as the gastric and intestinal juices sufficient for a normal sized stomach and intestine become insufficient for those twice as large. Often this fermentation causes colic, which may be like writer's cramp, because of weakness. The paralyzing effect of fermentative gases and alcohol interferes with the functions of the epithelia, which become as it were drunken, their elective powers are deranged and thus matters enter the blood circulation which cause acute and organic disease. The law that herbivora have large and carnivora small calibered intestines has been made use of with astonishing effects in the treatment of those suffering from enlarged stomachs and intestines. (*See* Food in Surgical Affections.) In the cases of long-continued fermentation, the stomach and intestines are thickened, strictural sometimes because of this perverted metabolism under the aforementioned paralysis from gases and alcohols. Pathologists are at present somewhat at sea in their description of such thickenings, as the line of demarcation between fibroid and malignant tissue is hard to make out. The alcohol and the vinegar yeast plants abound in such alimentary canals. This has already been considered under *alcohol and tuberculosis;* it would appear that the lung lesions are caused by the fermentation largely obtaining in the small intestine, with the consequent absorption of morbid matters, while when long continued in the large intestine, we get cases of consumption of the bowels or of fibroid or malignant thickening; in the latter instance, there must be a causative, a great expenditure of nerve force from overwork, worry, anxiety, grief, shame, poverty, etc., to have the retrograde tissue metamorphosis pass the fibroid stage into the malignant or cancerous.

The spinal axis and its derivatives suffer from said fermentation; the thickening of the sheaths of the spinal nerves and the fatty degeneration of the cord itself may come from the same cause that thickens the intestinal walls; add tertiary syphilis to this condition and there is more trouble. Again, patients under treatment for nerve degenerations and improving will be set back by eating a meal composite and complex that speedily ferments.

The fibroid degenerations found in abdominal tumors as well as cystic degenerations, are amenable to food treatment which embraces the stopping of the fermentative conditions and the best of nutrition instead afforded. The osseous system, it is reasonable to expect to be interfered with, by the same conditions.

The blood suffers from said fermentation by an increase of its fibrin filaments, its red corpuscles becoming adhesive, and the introduction of foreign matters by the drunken epithelia of the villi and re-entrant glands of the small intestines. We know that stopping fermentation in the bowels has removed the said abnormalities in the blood of our patients.

Said fermentation, specially in the stomach, affects the heart; the gases from a distended stomach have, by osmosis, caused palpitation and in some cases death from paralysis, particularly about two or three A.M., when the greatest stomachic accumulation occurs, though the heart has the least work to do because of the recumbent position; other causes of these fatalities arise from this fermentation, to wit: the ropy, sticky condition of the blood before described causing greater work on the heart and further a lessening of nutrition from the partially paralyzed stomach and bowels. Also, the paralyzing influence of stomachic gases, if it does not kill, helps promote fatty degeneration of the heart, that includes arterio-sclerosis and cholesterine degeneration into a stony heart.

The kidneys suffer from their specially complicated anatomy, so that the circulations are retarded and impeded and the result, a fatty or fibroid degeneration, so familiar in Bright's disease.

The liver, a dense and compound organ, suffers from the loss of nerve force caused by fermentation.

The head is a special sufferer; colds in the head and catarrhs were found in sole easily fermenting food eating, the latter being often secretions of partially paralyzed oral, nasal and post-pharyngeal glands. Dry catarrh, pharyngitis sicca, is soonest cured by appropriate topical treatment, the stopping of fermentation and the giving of large quantities of hot water daily.

The brain is intimately influenced by fermentation; the action of alcohol is treated under another head. Experiments with sole feeding of oat meal and coffee produced much fermentation and diarrhœa, with dizziness, vertigo, reeling, unsteady gait, in healthy men in eight days.

Uterine and prostate gland fibroids have been relieved by systemic treatment, which prevented the subject of this chapter; it may be stated that nature when overworked, underfed and partly paralyzed, will lay down an excess of fatty or fibroid tissues, same being lower grade than the tissues they have usurped.

CHANGES IN FOOD BY COOKING

It is impossible to do justice to a subject of such vastness, newness and deepness in a food primer. One may apprehend but not comprehend it. And yet it is a vital subject with which man must deal or die because there are not enough of edible raw foods to eat and the great majority are inedible.

Cooking aims are: (a) to remove the objections of raw foods; (b) to change cereal starches to glucose; (c) to soften and break down connective tissues in plants and animals; (d) to expose interstitial food substances so that the juices of the alimentary tract can have easy access; (e) to make foods more soluble in the alimentary canal; (f) to save nerve force in assimilation—a child died from intestinal impaction of raisins, suffering great agony, as all its nerve force was employed and exhausted in the attempt to digest; (g) to get the maximum of food force with the minimum expenditure of nerve force. Chemistry and pharmacy may be termed departments of cooking. The botanist has to cook in some of his branches of work. Are cooks drudges? If so, then dealing with the wonderful, past finding out, intensely refined and subtle, entirely beyond the reach of man to comprehend, results, is menial. Yet such operations in organic and inorganic chemistry are deemed of the highest character. Is it drudgery to prepare things whose structure, formation and analysis have baffled the greatest human abilities to solve? Drudgery when the character, abilities and success of a man depend on his food?

Tests of Good Cooking

A. *The copper reaction of grape sugar* in cereals and other starch-containing foods, commonly called the Fehling's test. Cooking more or less changes the starch to sugar which reduces copper to its red oxide by test. Hence thus tested, properly cooked cereals, etc., should produce the beautiful scarlet red cupric oxide, thus showing that the starch has changed from insoluble colloid to a soluble crystalloid, and is capable of absorption in the alimentary canal. The degree of color in the test shows the amount of dextrosing, sucrosing or glucosing. The test is generally used by physicians to detect diabetes mellitus with the same reagents, test tubes and accessories. These words apply to cooking by heat and cold. It would be well if our cooks used it.

B. *Polarized light under the microscope:* Up to the present time, the writers have found this an admirable test of beauty. Raw starch polarizes light; potato starch gives a wondrous display that can only be fully appreciated by actual observation. Cook the potato thoroughly and the polarization ceases. Raw beef is another magnificent specimen under polarized light, and ordinarily cooked does not polarize. Here then is also a good test for cooking. Lately the senior writer has had beef cooked by steaming, and even when the meat was cooked dry from the accidental escape of steam, some of the fibers polarized blue. The beef tasted and digested well, so perhaps here is an exception.

C. *Morphology of good cooking:* The subject is vast, new and almost unknown; it is impossible to do justice to it here. There should be illustrations of raw and cooked foods and let them speak for themselves. We can only mention a few foods premising that the zoologist and botanist use heat to soften specimens, so that they can be made thin and transparent enough to see through them. To be sure with modern appliances of direct light, the opaque objects are seen and photographed beautifully. But the ordinary observation of the microscopist is through the object. Perhaps there is no field of microscopy greater than that of the kitchen; it is hoped that learners will not neglect this mine of gastronomic knowledge.

Potato, white; raw section: Shows a network of white connective fibrous tissue woven in reticulations, like a fish net without the knots; inside each reticulation, the starch grains in various sizes lie thickly aggregated in nacreous masses. *Cooked,* all reticulations disappear; a collection of great sacs fill the field and are full of starch that is mechanically broken down, has no pearly look, and is a confused homogeneous mass that does not polarize light; if the cooking is imperfect, some starch grains will be seen that polarize light; the morphology has been completely changed by the inscrutable action of heat.

Beans, Boston baked: Raw section shows a dense compact structure; outside membrane, made up of prisms that fit close together side by side; substance is made up of reticulations of connective tissue fibers, that are distinct like strings; interspaces filled with starch grains, globar and polarizing light; the whole fabric seems made to withstand unfavorable environments; the bean certainly keeps well in this climate. *Thoroughly cooked,* the reticulations disappear, the field is filled with oval, ovoid, obtusely triangular sacs with a transparent glassy wall of cellulose, whose thickness, if the amplification was to the size of an egg two inches long, would appear as one-fourth inch—these sacs contain the starch comminuted and mixed up in a homogeneous mass that does not polarize light; if the cooking is incomplete, they will polarize according to the amount of cooking; the outer membranes when appearing in separate masses, show a collection of hexagonal prisms with straight wall; from above, they remind one of the prisms of the Giant's Causeway, Ireland; often the sacs are ruptured and the contents escaping. When one considers that the walls of cellulose are insoluble in the alimentary tract and that starch half cooked, if not digested will ferment, it is no wonder that the intestinal gases are abundantly formed and the results are unpleasant sometimes. (*See* Fermentation.) The Lima or French bean is more digestible than the conventional Boston, as the elements of its skin are like a double crossed T connecting at the ends of the cross bars, and hence their hold is more fragile than if they laid solidly together.

Wheat: Difficult to describe without illustration; its architecture is complex, showing beautiful solid geometrical manifestations; has seven teguments, the whole grain being fitted to endure for many years if kept from heat and moisture; its starch is quite globar and polarizes light. *Cooked,* the starch is distorted, wrinkled, has cleavages and loses its normal shape and power to polarize light; often it is obliterated into amorphous masses.

Note.—This chapter is but a syllabus-memorandum.

This chapter is a commentary on matter in *Johnson's* justly famous and esteemed HOW CROPS GROW.

The amyloid or cellulose group in plants are Cellulose, Starch, Inulin, Dextrin, Gum, Cane Sugar, Fruit Sugar, Grape Sugar, Liguin.

Starch and Cellulose have identical chemical composition, $C6\ H10\ O5$; Inulin, liquid from artichoke, is the same. Dextrin, $C12\ H20\ O10$, is a gum found in old potatoes and young wheat plants. Ferments and acids produce Dextrin from Starch and Cellulose. Nearly one pound of Dextrin has been obtained (Limprecht) from two hundred pounds of young horse flesh.

One of the most remarkable facts in the history of amyloids is the facility with which its members undergo mutual conversion. The machinery of the vegetable organism has the power to transform most, if not all, of these bodies into every other one, and we find nearly all of them in every individual of the higher order of plants at some stage of their growth.

In germination, seed starch, is converted into dextrin and glucose. Thus soluble, it osmoses into the embryo as food. Here again it is solidified as cellulose, starch or other organic principles, making the chief part of the materials for the seedling structure. At springtime, in cold climates, starch stored over winter in the new wood of many trees (maple especially) seems to be converted into sugar in the sap, that carried upwards to the buds, nourishes the young leaves and is then transformed into cellulose and starch again.

The healthy sugar beet root juice, ten to fourteen per cent. saccharose, is destitute of starch.

In animals, the amyloids change when used as food. Cellulose partly, starch, dextrin and gums are all converted into glucose. Fats, oils and wax are chiefly in seeds of hemp, flax, colza, cotton, bogberry, peanut, butternut, beach, hickory, almond and sun flower, etc., ten to seventy per cent. oil, also in cereal grains, oats and maize. The lower leaves of the oat plant at bloom contain ten per cent. of fat and wax, dry. These are not the plant essential volatile oils.

In the animal body fat (in insects and man's ears and crystalline lenses) wax is formed or appropriated from the food and accumulates in considerable quantities.

One of the most important questions of agricultural chemistry is to feed animals for the most rapid and most economical fattening. However greatly the various fats differ in external characters, they all are mixtures of three elementary fats, stearin, palmatin and olein, consisting of carbon, hydrogen and oxygen, and making up tallow, olive oil and butter, and are ingredients of the food of man and domestic animals.

Centesimal composition of the elementary fats

	Stearin	*Palmatin*	*Olein*
Carbon	76.6	75.9	77.4
Hydrogen	12.4	12.2	11.8
Oxygen	10.0	11.9	10.8

Phosphorized fats: The brain and spinal cord and the yolks of eggs contain them, 1.21 to 2.53 per cent. They have been found in the sugar pea as follows: carbon 66.85, hydrogen 9.52, oxygen 22.38, phosphorus 1.25. Are not then peas good brain food?

Topler found phosphorus as follows in the oils: lupin 0.29 per cent., pea 1.17, horse bean 0.72, vetch 0.50, winter lentil 0.39, horse chestnut 0.30, wheat 0.25, barley 0.28, oat

Protagon (Leibrich, 1864) is the phosphorized principle of the oil of maize, brain, nerves, yolk of egg, etc. Percentages of composition: carbon 67.2, hydrogen 11.6, nitrogen 2.7, phophorus 1.5, oxygen .17. Heated to boiling it yields glycerine, phosphoric acid, oleic acid, etc.

Relation of fats to amyloids: The oil or fat of plants is in many cases a product of the transformation of amyloid, because the oily immature seeds contain starch that vanishes as they ripen. In the sugar cane the quantity of wax is said to be the largest when the sugar is least abundant, and vice versa. In germination, the seed oil is converted back again into starch, sugar, etc.

The protein bodies or albuminoids are (1) albumin, or white of egg, (2) fibrin, or muscle, (3) casein, or milk curd. I. Albumin, of hen's egg, in the blood, the crystalline lens and blood corpuscles, globulin and hæmoglobulin. Vegetable albumin is found in all plant juices and in all respects agrees with animal albumin. Found in cabbage juice more than in potato juice. Water extracts albumin from flour of wheat, rye, oats and barley. (Nitrate of mercury test the best.) II. Fibrin from the clot of blood has many of the properties of albumin. Flesh fibrin is had by repeated squeezing and washing in water until the coloring matters are removed. It is in fact the actual fibers of the muscle. Vegetable fibrin, gluten from wheat flour, is an admixture of several albuminoids, and contains also some starch and fat. It does not dissolve in water and has no fibrous structure like animal fibrin, but forms when dry a tough horn-like mass. In composition it approaches animal fibrin. III. Casein, new cheese; unlike egg albumin, it is not coagulated by heat, but by acids, rennet and boiling in salts of lime and magnesia. It has been detected in the brain. Vegetable casein, from seventeen to nineteen per cent. of pea and bean, closely resembles milk casein in all respects.

The Chinese make a vegetable cheese from peas, sold as Tao Foo. Casein is found in oats, potatoes, turnips and many plants. In cruder wheat gluten two other albuminoids are: (1) gliadin, or vegetable glue; strongly resembles animal glue; (2) mucidin resembles gliadin, but is less soluble in strong alcohol and is insoluble in water. The exact composition of albuminoids is uncertain, as they are mixed with other matters from which it is very difficult to separate them wholly. They are altered and destroyed by our reagents, and our methods of analysis are scarcely delicate enough to indicate their difference with entire accuracy.

Albuminoids are termed proteids because they take the first place in physiological importance. In animals, all food albuminoids dissolve in the gastric juices and enter the blood, to form albumin and fibrin. In the lacteals, they are converted into casein, and in the appropriate part of circulation they are formed into egg albumin. In the living plant life changes of place and character occur among proteids. Outside the body, fibrin exposed to moist summer heat for some days dissolves to a liquid which has the properties of albumin. Remove the albumin and adding acetic acid to the liquid, curds are formed readily like casein. Lehmann has shown that when albumin is dissolved in oxide of potassium and mixed with a little oily fat and milk sugar, the mixture coagulates as milk curdles. Some think casein is a compound of albumin and oxide of potassium. Albuminoids are adapted to animal nutrition, being essential ingredients of muscles and cartilages, nerves and brain. They likewise exist largely in the nutritive fluids of the animal as blood and milk. So far as we know the animal body has not the power to produce albumin, fibrin or casein; it can only transform these bodies as presented to it from external sources (this is true in the main). The mammary glands secrete casein. Animals can live a limited time on themselves, a sort of cannibalization by which they grow poor, wasting their own tissues by the formation of the albuminoids, it must be, for body power. They are hence indispensable ingredients of food and have been aptly named by Liebig as the plastic elements of nutrition.

It is, in all cases, the plant which originally contributes these substances and places them at the disposal of the animal. But animals are eaten by animals, and the animal albuminoids, etc., are easier to assimilate and confer more force than the plants. Vegetarians take the ground that all human food should be from the vegetable kingdom. It seems to us that it is best to derive food from all kingdoms of nature—vegetable, animal, mineral and spiritual; the last because our chemists say that life (the spiritual kingdom food) resists, overcomes and modifies the affinities of oxygen and ensures the existence of a continuous and perpetual succession of living forms. Take life away and decay comes from the want of vital resistance to oxygen, physical conditions and cryptogamic vegetations. Physical and chemical amyloid changes are in one direction towards decomposition and simple compounds. To reverse this needs life or phytochemistry. In the laboratory, we reduce from the highest and more complex constitution to a simpler one. In the vegetable, all this is reversed and many more changes are done. (This shows what better chemists plants are than man.)

The albuminoids are mostly capable of existing in the liquid or soluble state, and thus admit of distribution throughout the entire animal body, as blood, etc. They likewise readily assume the solid condition, thus becoming more permanent parts of the living organism, as well as capable of indefinite preservation, for food in the seeds and other edible parts of plants. Proteids contain sixteen per cent. of nitrogen. In germination, seedlings, like nascent man, depend on the parent for growth. The seed food undergoes three simultaneous functions: (1) solution, (2) transfer, (3) assimilation. The solution is easy with albumin, dextrin, casein, gum and sugar. It is otherwise with fats, oils, starch, gluten. The changes have been traced somewhat. Sachs found that ripe squash seeds have no starch, sugar nor dextrin, but were very rich in oil, fifty per cent., and protein forty per cent. But the oils disappear and at the same time starch and sometimes sugar is formed in germination. The starch that is so formed from the fat of oily seeds, or that which exists ready formed in the farinaceous seeds, is changed into dextrin and sugar. Fat is also formed most largely at bloom time of plant. It cannot be too much impressed on those who study fatty degeneration that fats and oils are transformed from the amyloids. Immature oily seeds contain starch. Ripe oily seeds contain no starch. But in germination, the oil of said seed is converted back again into starch and sugar, and just here is shown again that plants are better chemists than men who cannot do this—furthermore that life is the spiritual power added to the physical to make such a change.

FOOD IN ACUTE DISEASES

From what precedes, it cannot be denied that food is an exciting cause of disease. It is also a predisposing cause. However much physicians may differ as to other things, they are united as to these ideas; the conventional question, when the profession is called to an acute disease, asked or unasked, is what has been the food? This query is also uppermost in the laity. Formerly the usage was to administer an emetic to expel the malefactor as dogs chew grass for the same purpose; it is a short way to relief and will not be abandoned if man knows as much as dogs. Sometimes the food is all right, while the patient has used up his forces pleasantly or unpleasantly and there is left an insufficiency to digest them; then nature will send an alarm through the whole body, to rouse and expel said food. One of this kind occurred in a case of fractured patella that was convalescing and felt well enough to study; began such at ten A.M.; fed at one and again at six o'clock, working on technical studies in the meantime; all was delightful till 6.30 P.M., when a mighty colic came on that shook like an earthquake; thinking that food might be the cause, an emetic was given and both meals came up sweet and undigested; the injured leg was cold as if dead; the trouble was that the dynamis had been pleasantly used up in study. Never take away the force needed to digest normal food.

An example of food as predisposing is seen when people live so that their blood is ropy, adhesive, sticky, fibrin filaments unduly developed, has formless and crystalline matters, so that the circulation is retarded and impeded; let such be exposed to cold and they will be very liable to contract pneumonia. Rheumatism is another example, the morphology of the blood showing the pre-stage.

Food cural: By abstinence and the patient cannibalizing himself; this is very good, but ten to fourteen days is a limit judged by well people who would not fast so long if they could help it. A typho-malarial case, foodless and medicineless for this time, was finally forced to eat beef essence and recovered so speedily that in ten days he returned home, some four hundred miles. In fasting it is well to give hot water enough to keep the blood liquid and promote downward peristalsis of guts, to give fresh air and baths and thus to clear out the alimentary canal of fermenting foul food, gases, etc. It is well to remember, that it takes more force to run the body in disease than in health, and that

Natura naturans is all the time striving to cure; the physician who conserves force in acute disease by putting his patient to bed, feeds simply and aids nature by whatever is necessary in the line of medication, gets results. This is also a very rich subject, but our limits will allow of but the following specific cases: Lately, a two year old was allowed to eat at the table, brown bread, vegetables and other things as the adults, and had cholera infantum seriously; the mother applied to a physician, who asked the conventional question as to food eaten; after the reply, he asked: "Mrs. ——, would you not like to have your child cured without medicine, reserving it for future use?" On her acquiescence, the child was fed milk, the whites of eggs dropped in boiling water and Bovril; the symptoms abated; the child slept so long that the grandmother was worried, but was told to leave the patient alone; in two days she was well.

A lady, aged fifty, mother of a large family, was suddenly attacked by an acute inflammation of the left lung, and so viciously that in the acute onset the two attending physicians labored all night, fearing speedy dissolution; the next day there was some abatement of symptoms of pain, dyspnœa, fever, which did not last, and the anxiety of the attendants as to closely impending death was not relieved till a dozen leeches were applied on the left chest, which filled with blood, dropped off and the patient allowed to bleed slowly into the bed. (Venesection is coming into favor again, we are glad to note, for it has its place in therapy.) Physical examination of the left chest showed dulness over the lower two-thirds; there was no bulging of intercostal spaces; but auscultation developed most curious rales, as if the greater part of the lung was more or less turned to fluid; the attack was about two decades ago and in warm June weather; the patient was made as comfortable as possible in bed, or in a Cutter reclining chair;

after a month she was moved to the sea-shore, where she remained till fall; the main foodal reliance in this case was broiled chopped beef (*see* same under Beef), eaten to the amount of two to three pounds daily, hot water, coffee or tea, with but slight additions of vegetable food at first; there was a complete recovery, the lung regaining full normal action.

FOOD IN CHRONIC DISEASES

Diagnosis: The morphologies of the blood, sputum, fæces and urine carefully ascertained; the chemistry of the urine likewise; supplemented by the usual physical examination by inspection, mensuration, auscultation, palpation and percussion, with consideration of historical features.

Food: In many cases broiled chopped beef is to be fed two and three times a day, and with some patients up to one pound a meal; this broiled chopped beef may be alternated, at times, with broiled or roasted beef, lamb, or mutton, the dark meat of turkey, fowl and game; a thin slice of ham or bacon broiled, allowed with broiled chopped beef at times as an appetizer; the whites of eggs, dropped in boiling water and cooked moderately hard, in profoundly weak cases allowed freely, in some up to twelve to eighteen a day. *Vegetable kingdom food:* Toasted bread, cracked wheat, wheatlet, wheatena, rice, hominy, baked potato, German fried potatoes, string beans and green peas in season, spinach, any one or two of the foregoing at meal; *the chemistry and morphology of the urine and morphology of the faeces and blood determining whether the introduction of any of the foregoing foods agreed or not;* the reliance as to solid food, to repeat, placed on the broiled chopped beef. *Relishes per se:* Pepper, salt, butter, Worcestershire sauce, horse-radish, lemon-juice, coffee, tea, tobacco, celery, lettuce, water-cress, according to the demands and response systemically by the patient.

Baths: Ammonia and water or sea-salt water, at temperature best for patient, daily by the use of sponge, whether in bed or about.

Exercise according to conditions; in some entirely passive in bed by rubbing; in others, by trolley or automobile or carriage; in still others, patient to be placed on a bare-backed horse and the latter led about the yard.

Rest, mental and physical, before and after meals always enjoined.

Medicines as per arising conditions; tonics, cholagogues. alteratives, digestives, aperients, anodynes; the last make the hardest problem, especially in cases of nerve-degeneration, where the crying out for sustenance (the idea of the ancients, and it is good) is accompanied by pain, pain, pain.

Hot water, i.e., water raised to the boiling point, cooled in a saucer to a comfortably hot degree, and slowly sipped in one-half to one pint doses, one-half to one hour before each meal and on going to bed, is commonly prescribed; urine going below 1016, amount diminished; aerated distilled, or spring water, with not more than ten grains of salts to the gallon, to be employed.

The foregoing is necessarily very general: indeed, as in achieving anything in life that is good, there is no royal road to success in the management of a chronic case; the physician in attendance must study his patients constantly, and this leads to the advice that the financial part of the matter must be thoroughly understood; a chronic case may be under observation for two years; it may be permanently relieved in a few months; in either case the physician and patient must keep in mind that while surgical work covering fifteen minutes to half an hour will save life, and the operator is gratefully paid fees which range up into the thousands in some cases, that the end achieved medically in a chronic case is of just as great importance and will require months of work on the part of the attendant. On the patient's side, his finances may be in such shape that a long fight for health may not only impoverish him, but his family; such a condition necessitates the greatest frankness on the part of the patient; the physician who is to make the fight for amelioration, if not cure, must know where he stands.

Finally, the art necessary in the successful management of this class of disease is something to be acquired only by the broadly trained man of medicine. The layman who may read this book and take unto himself the management of his own case or of those dear to him, will soon get into trouble; the accurate use of the microscope and chemistry he knows not of; the "shadings" so well read by chemists, biologists, lawyers and physicians in their respective professions are beyond him; or the evidence presented to the attendant as to blood, digestion and assimilation, may necessitate at times the prohibition practically of all foods from the vegetable kingdom until the system is working normally; admitted gladly that these are days when the layman knows many things, yet his knowledge, outside of his own calling, is only sufficient to lead him to his medical adviser, and to give intelligent co-operation in the fight with disease. Specific directions in writing, subject to change, should be given patient after diagnosis is made. The following limited number of case histories we present as pictures of some sides of this work:

1. *Arthritis deformans; tubercular joint,* (?) - 1901. Englishwoman, aged thirty-eight; governess; had taught in England since 1884; in this country since 1889, caring for two lads in a well-to-do family; unmarried; medium height; body well nourished, excepting left thigh and leg, which

were somewhat atrophied; left knee-joint considerably enlarged and painful to touch over condyles; flexion only to forty-five degrees; locomotion on level, safe, sidewalks, comfortable if in moderation; stair-climbing painful; this condition had obtained for twelve years; resection advised by surgeons in England, who had kept the limb in plaster cast at one time for three months; blood under the microscope showed an excess of fibrin filaments, red corpuscles sticky and huddled together; some free subdermal fat; urine bilious, with but occasionally a trace of albumin; no casts or fatty epithelia. This case was treated as falling under either head of the caption above. Besides the general systemic treatment, as adjuvants were used biniodide of mercury, one-sixteenth grain, three to four times a day with hot water; iodide of potash, four-grain doses before meals; simple tonics and digestives as the progress of the case indicated; after some months of persistent treatment, mesotan was used locally on the joint and has been used ever since; for the last year the patient has been taking no internal medicine; is living on a broader dietary, but making beef the mainstay. There has been a marked improvement in the condition of blood and urine; the knee-joint has somewhat reduced in size; there is a diminution in the hyperæsthesia and the patient ambulates with much greater freedom.

2. *Arthritis deformans; incipient locomotor ataxia.*—Successful business man, aged thirty- two, had been suffering for two years with what was called rheumatism; pains in neck and the joints of all the extremities; swollen metacarpal and metatarsal joints; in winter, no matter how well dressed and gloved, on coming into the house the fingers and toes would be of a ghastly, yellowish-white, and on circulation resuming its sway the pain would be excruciating. The patient had had full swing at all the anti-uric acid treat-

ment. Blood-morphology gave but little evidence of tendencies even to rheumatism; urine somewhat bilious; no albumin, sugar, casts, or fatty epithelia; indeed, the case presented the appearance of a fairly well-established peripheral trophic disturbance due to central nerve-lesions, with but little evidence of disturbance of blood and urine. But little medicine was given in this case. It should be said that the behavior of the stomach was capricious, as if suffering from defective nerve-supply. The condition of this patient has markedly improved; joint disturbances practically nihil; swellings have disappeared; he has not always stuck to his regimen as closely as he should and deviations have retarded the progress of his case.

3. *Arithritis deformans; pre-locomotor ataxia.*—1897. Married woman, aged sixty; anchylosis right shoulder joint; partial anchylosis of the neck; unable to raise herself in bed; if put on the floor standing, ambulated with difficulty, and could not go upstairs because of weakness in knees; blood showed, under microscope, free subdermal oil, fat in leucocytes, emerald green, bronze and other pigmented crystals; urine—albumin, fatty epithelia, casts, not in abundance and not always present together; free oil in fæces. This case was rigidly treated for eight months; but little medicine was given; she was visited once monthly and watch of her case kept by examination of urine and fæces thrice weekly. At the end of ten months' time she was able to travel to the Pacific coast with a party of friends, and stood the pleasures and discomforts of the trip better than any one else in the party; shoulder and other joints normal and remain so.

4. *Locomotor ataxia.*—1895. Man, aged thirty-two; measles at age of six had stunted mental development; had the usual run of childhood diseases; seriously ill at fifteen, with evidences of tuberculosis pulmonalis, from which he

recovered; 1891, began to have trouble with locomotion, which increased until 1895, when his condition is: cannot stand unless supported by an assistant; if left alone, his body flexes to the right so that the right fingers touch the floor; full history of the pains of ataxia; blood showed free subdermal oil, fat in leucocytes; urine showed albumin, casts, fatty epithelia, not conjoined, but appearing alternately; also much protoplasmic catarrh. While under treatment, was moved to the cars and taken to Maine for the summer. Volunteered examinations by local sojourning physicians resulted in diagnosis of incurable locomotor ataxia. This man recovered and remains in moderate health to-day, walking with ease.

5. *Locomotor ataxia.*—March, 1904, a man aged fifty-six, consulted the junior writer; by profession a civil engineer; thoroughly educated here and abroad; with this training and the best of habits, business and personal, he had achieved success; weight, one hundred and fifty-six; height, six feet two inches. He related that for about four months he had been suffering from a cold on the lungs; that a physician under whose care he had been recently, stated that he had a tubercular lesion in the right lung. Examination—right lung normal, with the exception of occasional râles upper portion; left lung, râles over lower half—but slight increase, on percussion, of dullness; heart somewhat enlarged and beating at one hundred; sputum profuse, containing mucous corpuscles enlarged and distended by granular gravel, also gravelly concretions freely found; finger-nails in normal condition; no fever; no hectic appearances; no night-sweats. Blood showed slight tendency to ropiness of the red corpuscles; there were present but slightest increase of fibrin filaments and no evidence of tuberculous matter, of which much has been written by American writers. Urine normal, except as to some bile and the presence of protoplasmic

colloid catarrh; liver somewhat enlarged. The two things which disturbed the patient were loss of flesh and pain, the latter mainly evidenced in the chest on either side alternately.

Diagnosis.—Tuberculosis negatived; it was stated frankly that the left lung was in an asthmatic catarrhal condition; that the liver was enlarged and that the nerve symptoms were an accompaniment of the presence of protoplasmic colloid catarrh in the urine, and that there was danger of some serious trouble in the nervous system; this was enlarged upon to the members of his family and a careful prognosis given.

He was placed on treatment and somewhat improved for a couple of weeks; then the pain element became worse and it was necessary to put the patient to bed. The gravelly condition of the sputum diminished, together with the amount of expectoration; the urine cleared of the bile and catarrh; the blood, which had not been far from normal, became normal; yet the pain element increased; first one lung, then the other; then the right side, over the liver; then in the bowels; then in the legs; then the thighs; and finally it located itself in the right hip. At this time the liver had increased in size and was freely felt under the free margin of the ribs. The patient was under the care of the late Dr. Geo. F. Lightfoot, of Arlington, N. J., and the junior writer. A consultation with New York and Newark physicians resulted as follows: that there was no tuberculosis, though the left lung was markedly dull on percussion. One of the consultants, because of a lump found, about the size of a hen's egg, under the liver, suggested gall-stones and that the pain in the right hip came from that as a reflex; both agreed that the possibility of a nerve degeneration was the only solution and due to an attack of grip two years before; one suggested operation for gall-stones, which the family, as well as Dr. Lightfoot and the junior writer, could not agree to. Surcease in part from pain only by the use of morphine, which would bring back bile in the urine and the liver would swell; yet calomel in divided doses would relieve the same; patient losing flesh steadily. Sticks closely to directions, and the closest medical care is given.

In June the family desired that the senior writer, who at the time was out of the State, should see the case. The latter responded, and about four hours were spent in the examination of the patient and his blood, urine, fæces and sputum. At this time, the pain, which had been such a fearful symptom, had diminished; the patient was taking much less morphine and was eating well; but a new symptom had arisen; to wit—difficulty in swallowing. A most careful laryngological examination was made by the consultant; beyond a dryness of the throat mucous membranes, there was nothing abnormal; yet it was almost impossible for the patient to swallow. He talked frankly with the consultant, who assured him that it was absolutely necessary for him to eat and drink, in which he acquiesced. This was on a Tuesday; Wednesday and Thursday some improvement in swallowing, which was, however, but temporary, the difficulty returning in increased force; nourishment given by the rectum, but the patient went quietly down the hill and died the following Sunday. No autopsy, though much desired by attendants. The diagnosis reached at the final consultation was of nerve degeneration; that the abatement of pain in other parts of the body showed amelioration and that the symptoms as to the throat were caused by a breaking out of the disease in the nerve centers governing the same; that if we could carry the patient over that point in the history of his case, he stood a reasonable hope of recovery. It is hard to fight out such a losing battle with death as this was, and to the physicians in attendance the only pleasing feature was the splendid, intelligent co-operation of the family.

6. *Angina pectoris.*—Over twenty-five years ago, a mother was sick under a complication of diseases, in which angina pectoris was a prominent feature; the attacks were almost daily; she was prostrate in bed without appetite and too weak to raise voice, hands or head; the heart's area on percussion was larger than normal; the first sound presented a sonorous murmur, heard towards the left; aortic sounds normal; impulse increased; the sense of constriction, suffocation and impending death was markedly characteristic, as if a giant gripped her chest; bad prognosis given; she was persistently fed against the appetite and in due time recovered normal tone and action of the heart, living twenty years to die of other troubles, the heart remaining faithful till the end.

7. *Enlarged heart, simulating tuberculosis.*—A veterinary student some twenty years ago sought advice because of several hemoptyses; blood morphology negatived tuberculosis; the patient was much run down from overwork and underfeeding; examination of the chest confirmed the blood finding and demonstrated that the hemoptyses were due to an enlarged condition of the heart causing a stasis of blood in the lungs, said stasis relieving itself by forcing the blood through the mucous membranes with subsequent expectoration; stringent orders were given as to proper feeding, rest and hygiene; but little medicine employed: the gentleman is in the active practice of his profession to-day.

Note.—It is a common thing in the management of chronic cases to have patients voluntarily call our attention to the fact that in the course of treatment the left chest wall, which has been larger than the right, has gone down to normal; by physics, this is easily explained; given, a blood stream of increased specific gravity due to an increase of fibrin filaments and a massing of the blood corpuscles, the heart must automatically increase in size to meet the augmented work of pumping the blood through the many thousands of miles of microscopic capillaries; further this enlarged condition is found in athletes unduly trained; bringing the blood back to normal condition with proper treatment of any disarranged functions, the nutrition of the heart takes care of itself; this work is accomplished sometimes with a speed that is amazing, as in the following case:

8. *Enlarged heart.*—1898. A young man, about to take (in a month's time) examination for one of the arms of the military service of the United States, presented himself for thorough examination, stripping to the nude; urine was found to be somewhat bilious; liver otherwise normal; kidneys, stomach and nervous system normal; blood not much out of the way; fine condition of the lungs with ample increase on inspiration; but the heart was banging and pounding over an enlarged area, and the area of dulness on percussion was increased; had been an athlete and smoked cigarettes considerably; how much the latter had to do with his condition is not known; the heart's sounds were those of what is called a "tobacco heart;" he had stopped his cigarettes; cholagogues were administered; strychnia freely given; careful directions imposed as to the drinking of plenty of pure water and a limited diet as to starches and sugars, with unlimited use of broiled beef imposed; the candidate passed both physical and mental examinations and is a commissioned officer to-day in the service of our great Republic.

9. *Obesity—enlarged heart.*—In 1888, the junior writer was engaged some eight hundred miles from New York on special work covering six months of time; a young woman

of small skeleton, moderate height and weighing two hundred and fifty-six pounds, consulted him because of the inconvenience of her obese condition as well as for dyspnœa; the fat was so much that to accurately mark out the outlines of the heart was impossible; suffice it to relate exertion brought on the dyspnœa noted; she was rigidly dieted on little but broiled beef preparations; salicin and strychnia employed as heart tonics; plenty of water allowed; on returning to New York, she kept in touch with her adviser by correspondence and sending specimens of urine; one such contained the largest deposit of cystine crystals that we have ever seen; she was warned that she had been eating either the yolks of eggs or oatmeal and to look out for a nasty attack of rheumatism, which unfortunately came, needing the attention of local and consulting physicians, the site of attack being the stomach; her weight had been reduced under systemic treatment one hundred pounds and her heart beautifully weathered the mix-up of cystinic blood and the stomach; this case was living ten years thereafter in good health.

10. *Obesity—weak heart.*—1905. A mother aged fifty-eight, born and reared in comfortable circumstances, which have persisted all through life, of below the medium height, weighing one hundred and sixty-eight pounds, complained of difficulty in climbing stairs, of pain about the heart and flushing of face and head on any unusual exertion, that is for her; heart pulsation, irregular, beating three or four times regularly, then intermitting; same difficulties as in previous case as to exploration of chest and determination of actual size of heart; this patient was treated for nine months; reduction of weight, one to one and one-half pounds per week; the blood being somewhat ropy and sticky, small doses of iodide of potash were exhibited with upsetting

effects; likewise small doses of phytolacca decandra could not be borne; cholagogues were prescribed for liver; strychnia mainly for heart; the patient had been a great eater of sweets, and diet therefore somewhat irksome, though not as restricted as in previous case; the result of this nine months of work is eminently satisfactory to the patient and the family as well as the medical attendant.

11. *Epilepsy—le petit mal.*—Though *petit,* was big enough to wreck the brilliant prospects of a young collegian; his urine showed albumin, fatty epithelia and casts, not synchronously but separately; at times, the abundance of kidney casts was excessive; this patient was considerably relieved but changed treatment and is living to-day on a farm, after a lapse of fifteen years, uncured of his nerve condition.

12. *Epilepsy—le grand mal.*—Girl, thirteen years of age; albumin in urine marked; also present casts and fatty epithelia; difficulty in managing patient, an orphan; solid food restricted to broiled beef and then changed to steamed whole wheat; if the patient did not drink molasses from a jug, or otherwise disobey, there were no convulsions; after some months she was able to bear without digestive troubles beef and wheat together, and as the case progressed, other foods were brought into her dietary; seen eight years after commencing treatment, she had been well, with no recurrence of seizures.

13. *Chronic Bright's disease.*—March, 1898, a middle-aged man sent from a Southern State, where he had been wintering, to the senior writer six specimens of urine, the examination of which resulted in a diagnosis of impending Bright's disease, and of scrofula. The gentleman went to a large city, was under the care of an eminent physician for five weeks, who contradicted the diagnosis of Bright's; then

was treated by another physician of national reputation, who examined but one specimen of urine and also negatived Bright's.

September, 1898, the sick man, dissatisfied, came to New York—the senior writer had not returned from his summer sojourn at Buzzard's Bay and the case fell to the junior writer for examination—and stayed here one week for daily study. Blood somewhat rheumatic, free subdermal oil, fat globules in leucocytes and scrofulous. Urine, on testing by nitric acid and heat, filled full with albumen, which on settling would take up half the bulk of specimen; bile present; under the microscope, casts and fatty epithelia were very plentifully found, also amyloid; slight colloid catarrh and more of same in fæces. Patient distinctly informed of his condition of Bright's disease and weak heart, and hope given him that he might be relieved; decided to be treated; went to his home, four hundred miles distant; thrice weekly sent specimens of urine and fæces, and of sputum when there was same; the evidence furnished by study of the last showed asthmatic tendencies.

June, 1899. Seen in Pennsylvania by the junior writer while away at a consultation. The urine had meanwhile practically cleared of albumen, with great diminution of the abnormal morphologies; blood improved; general condition much better. Treatment continued for another year.

May, 1901. Has come to New York for overhauling; a visit of ten days. Blood—no rheumatism, but slight traces of free fat and scrofula. Urine—no albumen, no fatty epithelia, no amyloid; daily examination for the period of visit showed but one cast. Catarrh of the nasal, pharyngeal, and urinary tracts, and somewhat of the bowels, as shown by the colloid discharges. Some days has been able to walk eight miles. Had wintered in a Southern State, and the cold, raw weather of the unusual May of 1901 has depressed him. In better condition, 1904.

15. *Chronic Bright's disease.*—1885. Middle-aged woman; same evidence of Bright's disease as in the foregoing case; also capillary bronchitis with asthmatic sputum containing lung fibre. Living to-day, with no evidence of Bright's.

16. *Double pleurisy and tuberculosis.*—Before the Civil War, the senior writer in company with the late Dr. Benjamin Cutter, examined a case of double pleurisy and tuberculosis; naturally the prognosis was not encouraging; the patient was an Irishman, who had a fine hog in the pen adjoining the house; he was advised to kill the hog, (it was winter time) and eat him without any aid from his family; the man turned up a year later in good health and said that he had eaten the whole of the hog. This was before the days of careful beef feeding in tuberculosis.

Space does not permit other practical illustrations except as under Food in Surgical Affections and The Care of the Aged; *tuberculosis* has been referred to specifically under *Alcohol and Tuberculosis,* and *Fermentation,* and needs no amplification here; reference to the bibliographical list will lead to further information. We wish to emphasize that the profession is far ahead of the laity in the appreciation of the importance of the management of chronic disease; it is so easy and comfortable to take hold of one in the prestages of a chronic ill and put him on his feet; the medical man sitting in a restaurant and leisurely surveying those about him picks out men and women that he knows are doomed to near extinction unless they mend their ways; that the family physician is hampered, despite his hold on his clientèle, is sadly too true; it would seem as if men would not think of the possibilities of the habitat of their divine spirits being in need of repair; if their friends become ill, they are full of solicitous attention and the physician called in, has his hands full with what is liable to be a hopeless job; without any question, this is the most important work for the medical profession, whether among the rich or the poor; indeed, the time will come when the State will have to employ, for purely economic reasons, physicians of experience in general medicine to care for the moderate wage earner; this means a revolution of our present pauperizing hospital system; the enlisted man in the military service receives the care of the best medical talent without any loss of self-respect; the judiciary are well and justly paid for eminent services; likewise the physician in hospital work should be; the State of New York has done much through its Department of Charities to cut down indiscriminate charity; but this work is only the inception; healthy and serene old age should be the heritage of all, and can be obtained only by proper living; the finest work in medicine is to be the preventive management of chronic disease with death at greatly advanced age by the simple, kindly, snuffing out of the candle of life. (*See* The Care of the Aged.)

The writers are not particularly enamoured by the medical utterances of "yellow journalism;" we do take pleasure, however, in abstracting an editorial of *The Evening Post* (New York, November 8, 1906), with due thanks for a notable lay pronouncement:

"Real Prevention of Disease."

"The great benefit that medical science has brought to humanity in the last half century has been chiefly through preventive medicine. . . . But preventive medicine has concerned itself mainly with contagious diseases which threaten wholesale, and deals but slightly in the popular conception, with individuals. The result is that there has grown up in the public mind a feeling of carelessness regarding disease except where the State is supposed to protect us. We are much concerned about the purity of our drinking water, but few stop to ponder the fact that a majority of us will die of some chronic disease which in its incipiency might be arrested. For protection from acute infection we may depend upon boards of health, but for safeguarding against chronic disease we must trust to the physician. He, however, can do nothing to prolong our days unless we give him an opportunity to detect a malady in its early stage. Health is without price, yet how many periodically submit themselves to their doctors for thorough examination? That such a periodic examination is the wisest of precautions, is shown by the rejected applications in every life insurance company. Thousands were boastfully proud of their robust health until some life insurance physician rated them 'bad risks.'

"The conditions under which Americans live in large cities are particularly adapted prematurely to age the heart and arteries. In all probability, these conditions will not soon change, and the only way one may protect himself is by measuring the wear and tear on his organism. Medicine has grown rich in methods and instruments of precision for the detection of subtle changes indicating the onset of disease. A manufacturer with a fortune in machinery would not neglect to employ an expert engineer to scrutinize it from time to time. Very likely, however, the same man has omitted to ascertain through a physician whether his manner of life has worked ravages with his heart or arteries. Almost every one goes to a dentist at least once a year; why should one not go to a physician? . . . Oliver Wendell Holmes once said that the way to live to old age is to become the victim of a chronic disease and then take care of yourself. The real danger in the chronic type of disease is the insidious progress that gives its victim no warning, until the period when medical aid avails is past."

FOOD IN SURGICAL AFFECTIONS

It may be said that the main theme of this book is preventive medicine, and that proper feeding, hygiene, and necessary medication may prevent many of the surgical ills. Metabolistic surgery is better than the surgeon's surgery.

The practice of medicine involves the use of any means of relief as seasoned judgment after profound study may indicate; systemic treatment may relieve without surgery or may so reinforce the sick that surgery is employed with far enhanced results; an operation on a patient with sticky, ropy, blood, weakened heart and distended stomach and intestines, sometimes has to be performed, with small chance of successful outcome.

In the Section on Gynecology, of the Ninth International Medical Congress, Washington, 1887, Dr. R. J. Nunn, of Savannah, ex-President of the Medical Association of Georgia, stated that for years it had been his invariable rule to compel women whom he had confined, to be watched for a month or more after arising from bed, their hygiene and food closely attended to, and any local wounds topically treated; and he had not had a case of cancer occur in such so managed.

Thirty years ago, a middle-aged woman, suffering from a large hard uterine fibroid, was put on treatment in preparation for surgery or galvanism by profound abdominal puncture; in time, the tumor was so greatly diminished that the surgical or galvanic intervention was indefinitely postponed and eventually the tumor disappeared.

A few years later, a woman likewise middle-aged, with a correspondingly large and hard tumor, was treated systemically, with great improvement of general condition but little diminution of the growth; she decided on operation; at this time, the mortality in hysterectomies was not a pleasing subject for contemplation; the late Dr. T. Gaillard Thomas removed the growth by abdominal hysterectomy, the patient recovering so speedily that it was eventful on the side of normality; she is living to-day in good health.

1905, a young married woman suffered the first four months of pregnancy greatly from nausea, vomiting and anorexia; she finally aborted, and for the following six weeks there was almost daily menorrhagia; the junior writer saw the case in consultation with the attendant, a gentleman of large practice and splendid knowledge of surgical technique; we concurred that the hemorrhages were due to a sessile growth two inches in diameter, in the anterior wall of the womb; the proposition was put clearly to patient and husband, that three courses of treatment were before them: first, systemic and foodal; second, galvanic; and third, surgery; they elected the first, with the naturally associated topical treatment of tampons and such medication as necessary, and in four months' time the growth had disappeared.

1890, while the senior writer was in Berlin, one of his old patients consulted the junior for a flat, quite hard growth in the right breast, four inches in diameter; this patient, aged fifty-five, had been advised to have said growth extirpated; she was a professional philanthropist, constantly wasting her vital forces on reform work; advice was given that operation might not be necessary, and she agreed to eschew her philanthropies and to follow directions as to food, hygiene and medicine; the growth disappeared in less than six months of time, and she is living to-day free from it.

The use over thirty years ago by profound abdominal puncture of a galvanic current of low intensity and considerable quantity, in a series of cases of abdominal fibroids, resulted in cures of twenty per cent. and relief from distressing symptoms with diminution of growths in a large per cent., eight per cent. dying from natural causes; this explanation was then given as to the *modus operandi:* the galvanic current had so affected the nerve supply governing said growths, that nature was able, in the majority of cases, to increase her hold, so to speak, on said growths, and in part or whole absorbed them. But in feeding, we go still further, stop the causes lying in insufficient nourishment and the feeding of fermenting foods with the consequent paralyzing effects so often noted here, and in time also obtain results in a certain percentage of cases without surgery, provided the vital forces of the patient are not practically lost and directions are followed persistently without murmur or repining; determination or will, and that certain unmeasured and unseen element, constitution, have to be considered; no laboratory can measure such, and it is only the experience of the well balanced and trained medical man that gets the best out of such.

Cases of strictured bowels have been alluded to under fermentation; let us go a little farther, practically: a man, thirty years of age, was struck by a slowly moving locomotive and thrown twenty feet; was shocked and taken home for a few days, but had no local evidence of injury external or internal; he resumed work in the city and after some weeks began to complain of constipation and intestinal gases, with the passage of short, scrappy or ribbon-like stools; examination revealed an otherwise normal man; abdomen somewhat fleshy and no tumor could be felt; but the bowel conditions persisted; the patient's occupation placed him in touch with a number of physicians, who frankly admitted that it was beyond them as to diagnosis;* our opinion was that he was suffering from a strictured condition in the large intestine, due to shock to the nervous system, accompanied perhaps by some local internal bruise (if you please) caused by the impact of the locomotive; at any rate, a line of treatment that ensured a sweet condition of the stomach and intestines in a few months removed all of his symptoms of discomfort and the physical signs of the gross morphology of the stools.

1905, an overworked middle-aged man, whose profession required great mental activity and in whose family there had been much illness, began to lose weight and strength; on the abdomen appeared enlarged subdermal veins; the transverse colon was thickened and enlarged throughout its entire length, the emaciation of the patient making diagnosis most clearly palpable. Our anxiety as to the outcome was fully shared by the family and friends of the patient; treatment, *systemic,* was persisted in for months; there was a gradual absorption of the fibroid (if you please) tissue, and to date there has been no return; ten months of isolation from work was taken, sojourning in places from Florida to Maine, though difficulty was experienced at times in getting proper food when away from home.

THE CARE OF THE AGED

I. December, 1903; retired civil engineer (aged eighty) of international reputation; had been of exemplary habits, but an enormous worker; for months he had suffered from

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*These cases are rare.

swelling of the finger joints, preventing closing, with stiffness of the lower extremities causing difficult and painful locomotion; his trouble had been called rheumatism and for that treated; blood showed free subdermal oil in specimen; color below par; some huddling of red corpuscles; no fibræmia; none of the cystinic and other crystals found in rheumatism; urine at times slightly albuminous, but once only were found any casts. Diagnosis: disturbance in the central nervous system causing the peripheral troubles above noted. Was carefully treated, with slow return of normal locomotion; now he goes to his office each business day for consulting work in his profession.

II. About two months later, the patient's wife, some few years his junior, a delicate, fragile appearing lady, overate and went to bed with a violent abdominal colic; immediate treatment, a hypo. of morphin, atropin and hyoscin hydrobromate; systemic treatment followed; a sluggish liver was an important element in her case; also, great weakness. This case was "gentled" along for several months with careful nursing and medication; is now in good health, careful of what she eats, and sits in the seat of honor in her family, a comfort and delight to her kin and friends.

III. A rear-admiral, retired, at the age of sixty-four was found, with occasional slight evidences of albumin or casts, to be suffering loss of flesh, general weakness and hardening of the arteries. Habits had been exemplary as to liquor, fairly so as to food, but he had been a very arduous follower of his professional work; after eight months of treatment, his arteries had retured to almost normal feel; is living in fair health to-day.

We will not say at what age one becomes senile; these are strenuous days, but people are living longer than formerly and should live still longer.

The aged need careful attention, the physician examining secretions thrice weekly. In case III. the morphology of the feces was a very decided aid in the prescribing of food.

Aerated, distilled or a neutral spring water these cases need much of; best drank at a comfortably hot temperature one hour before meals, and on going to bed at night; urinometer will give indication of amount needed; the water should be previously raised to the boiling point. Avoid all charged drinks.

Foods that ferment into alcohol and vinegar must be forbidden, and beef must not be forbidden; the hardening of arteries is largely a matter of cholesterin deposits, a form of fatty degeneration; beef is the best of foods to wipe out such a condition. In case I. there was more or less fatty or fibroid degeneration going on in the nervous system; beef is of all food best fitted to arrest such degenerations, and replace by normal tissues. With the beef may be eaten the whites of eggs dropped in hot water and cooked moderately hard; dark meat of fowl, turkey or game, and mutton and lamb allowed as they agree. Bring in wheat preparations, baked potatoes, spinach, rice, hominy, string beans or green peas in season (but not canned), according as they agree. Bread should be preferably made from a gluten flour, but look out that the flour is not faked; the microscope will clearly indicate; avoid oat meal, baked beans, vinegar, desserts, pastries, cakes, salads, and indeed all swill-producing foods. We criticise the hog for its habits, but anatomically we are much like the hog, and eat things that are speedily swill.

Medication: Case II. had had a similar attack a year or so before and was ill a long time; criticism was made that the medication at that time had been too severe; these cases do not need large dosage; get your results, but do not overwhelm the nervous system thereby. The liver must be attended to; we like a mixture of equal parts of boneset and dandelion, fluid extracts, in doses of from one-quarter to one teaspoonful, in hot water, two or three times a day; with this one may have to add a little cascara sagrada; the exsiccated sulphate of soda, C. P., in doses of one-half to one teaspoonful in a cup of hot water in the morning is very efficacious; these cases need careful study in this line; as progress continues, less medicine will be needed; good old calomel at times is valuable. As to tonics, pyrophosphate of iron, salicin and strychnine, with small dosage, *i.e.,* enough to get effects; digitalis, if indicated, must be given with great care; we prefer tablets of the fluid extract. This leads to a consideration of

Coca erythroxylon as a food: This native of Peru, whose leaves have been used for centuries by the Andeans, is probably less understood than most properties of nature employed in medicine; it is confounded with cocoa by those who should know better; and further, its products as dispensed have been much sophisticated, intentionally or unwittingly. "The history of coca is most intimately entwined with the religious, racial, and even political history of Peru and the adjacent countries, and has even left its permanent impression upon that of their conquerors (see *Mortimer's Peru—the History of Coca.*). This history is of great physiological interest, since coca is unquestionably the agent which has enabled the dwellers of the higher Andes not only to withstand the effects of a high elevation, but to become noted for their physical strength and endurance in spite of them. Deprived of its support, those abilities fail. Foreigners going there have found it possible to gain a similar assistance from its use and to endure without distress physical trials, which are otherwise unendurable."—*Coca, National Dispensatory,* 1905.

Dr. W. Golden Mortimer, in his monumental work, says: "The probability is that coca, through its nitrogenous influences, so affects metabolism as to enable the organism to utilize substances which might otherwise pass off as waste"; quoting Bartholow we further find "It is probable that some of the constituents of coca are utilized in the economy as food, and that the retardation of tissue waste is not the sole reason why work may be done by its use which cannot be done by the same person without it." The senior writer is now in his seventy-fifth year, residing a greater part of the time at West Falmouth, Massachusetts, on Buzzard's Bay, and is engaged in original and literary work with visits to cities as consultations require; overdoing on a trip with a resulting upset of the enteron, the quickest and liveliest aid to normal condition was the use of Thé-Mariani; there was a sense of relief from exhaustion and prostrating weakness, which no other drug would give. For years we have been intimately acquainted with the Vin-Elixir and Thé-Mariani; too much credit cannot be given Angelo Mariani for selecting the right kind of leaves and properly transporting and rightly blending them in his always stable preparations; that the aged, as well as others in acute and chronic exhausting disease, have been greatly benefited by such we know well; those who cannot bear any preparations containing sugar, may safely use the Thé-Mariani, which is a fluid extract; the hearts of the aged need care, and the Mariani preparations as indicated are of wonderful assistance. In the collective investigation of Dr. Mortimer (*ut supra*) we find that coca has been used exclusive of all other food by seven physicians in cases ranging from three to twenty-one days, and in one case for several months.

Dr. J. Leonard Corning, in his work "Brain Exhaustion," says: "Vin Mariani is the best in the market; besides exercising an invigorating effect upon the cerebral centers, it imparts an indescribable sensation of satisfaction." In

"Brain Rest" he says: "This is undoubtedly the most potent for good in the treatment of exhaustive and irritative conditions of the central nervous system."

Dr. Beverley Robinson, *New York Medical Record,* says: "In 'Vin Mariani' we have a powerful stimulant to the economy that frequently will strengthen or give tone to the nerves in a rapid manner, that no other drug with which I am familiar can accomplish."

As to the dangers of cocaine habit from the use of reliable preparations of the leaves, Dr. Mortimer cites evidence of scientists who have thoroughly investigated local conditions in Peru, and have been satisfied to report that the only habit observed was that of longevity, in some instances to one hundred and thirty years of life.

Use *ammonia and warm water* sponge baths nightly as a matter of fine hygiene, enough ammonia to make the water soft to the feel.

On this subject a book could be easily written; these cases are generally a delight to manage; intelligent effort is appreciated by the patient; moreover, the physician will open up associations with those that have lived, worked, endured and learned, that will be of great mental and spiritual welfare to him.

Apoplexy, the foe of the aged and sometimes of the younger, needs attention here; it must never be forgotten that immortal Robinson Crusoe was written by Defoe after he had suffered from two strokes; it is of course best to detect these cases in their pre-stages; the blood and urine studied of people who have begun to age (perhaps prematurely from excesses) will tell the tale whether the case is drifting towards embolism or fatty degeneration of the blood vessels of the brain. Called to see a case stricken, the same means of diagnosis will differentiate between the two troubles and with consequent intelligent treatment; a plugged blood vessel is a different proposition clinically from a ruptured one. Furthermore, nature is a kindly Dame, even in these stricken cases; unless the damage is about or on a vital center of the brain, absorption takes place when causes are stopped and the system properly oiled and fed. The writers' cousin, Dr. Calvin Cutter, whose Physiologies are so well known to three generations, after his first "stroke," pluckily prognosticated the second and third and went about his affairs; the "strokes" followed in due time, Dr. Cutter surviving only a few days the last; this was nearly forty years ago; better medical work is now done, and it is a pity the present knowledge could not have existed then.

URIC ACID: MEMORANDUM

"The Chemistry, Physiology and Pathology of Uric Acid and the important Purin Bodies with a discussion of the Metabolism in Gout." By Francis McCrudden, of the Harvard Physiological Laboratory. This work is based on the statements of over seven hundred authors about more than two hundred and seventy subjects. We have treated herein (pages 70, 71, 72) to some extent the relations of uric acid and beef; the findings of McCrudden are directly opposed to those of Haig. This book, while not covering all of this subject, should be in the library of every medical man who desires to co-ordinate the knowledge obtained by chemistry, morphology and practical medicine.

SUMMER FEEDING

We wish to gently protest against the annual sententious animadversions as to beef in summer; the unusual abstraction of salts by excessive sweating and the depression caused by the action of heat on the nerve centers must be considered; many people think it wise to push ice cream (its sugar is a heat producer) and complex salads; these combinations are speedily turned to swill and do not make nerve force. The man or child who keeps his alimentary tract sweet and feeds his nerve centers with roasted or broiled animal foods and a moderate vegetable dietary, with careful discrimination as to the fruits he eats, will have little chance to suffer the usual summer upsets.

EPILOGUE

This labor of love and vexation is temporarily ended; of love as it is vital to our life work as physicians and men; of vexation, as it is so greatly condensed by the instructions of the publisher, that the fruitage is hardly more than a handbook or primer; further, the illustrations by microphotography and drawings, the former with powers ranging to the 1/75th inch objective, relating to the biology, pathology and therapeutics of food, have been eliminated and rest securely in the vaults of a safe deposit company till they are wanted. In condensing the text, specific references to the liver, spleen, kidneys and lungs, under each food, have been cut out; suffice it to say that the closing chapters contain sufficient matter relating to such organs for the time being; in fact, a thousand pages would not suffice for the full elaboration of this subject.

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INDEX*

*A full index, direct and cross, would take up many pages; the text of each food herein considered opens with general and historical considerations which are followed by systematic sub-divisions, so that the reader may easily find the chemistry, physiology, morphology, disease relations, etc. Under fish, is a general consideration of the subject and a specific consideration of scale and shell fish.

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